SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LII.—No. 18. [NEW SERIES.] NEW YORK, MAY 2, 1885. [$3.20 per Annum. [POSTAGE PREPAID.]

EXHIBITION OF PUMPING ENGINES BY C. H. DE LAMATER & CO. AT THE NEW ORLEANS EXPOSITION.

The accompanying illustration shows the exhibit of pumping engines manufactured by the De Lamater Iron Works, foot of West 13th Street, New York city. It is particularly noticeable on account of showing the great variety of pumping engines manufactured by this one firm, which extends from the smallest practicable hot air pumping engine to the largest size steam pump.

These works for several years past have been extensively engaged in the manufacture of pumping engines of every variety. They have given pumping engines for domestic use a vast amount of attention, and their exhibit attracts very much notice for this reason, as it contains several machines designed for that special purpose, and they all show the result of skill and thought combined with the knowledge of the varied requirements of the numerous conditions of water supply and the duties to be performed by domestic pumping engines. These pumping engines use atmospheric air for a motive power. The air is alternately compressed, heated (which expands it, thus furnishing the power), and cooled. The same air is used over and over continuously. There is no exhaust or noise of any kind, and there are no valves in these engines, except in the water pump.

Of these hot air pumping engines exhibited there are two varieties, styled respectively the *Ericsson* and the *Rider*. The *Ericsson* hot air pumping engines, which have been widely introduced within the last few years, are built, as are all the pumping engines manufactured by this firm, under a very rigid system of gauges, which makes the parts perfectly interchangeable, and they are made in such quantities that the cost of one of the smaller sizes comes within the reach of even the smallest property owner. They are particularly adapted for use in private dwellings, and, as they can be operated by either a gas jet or a wood or coal fire, they are among the most complete and convenient, as well as the cheapest, arrangements for raising water.

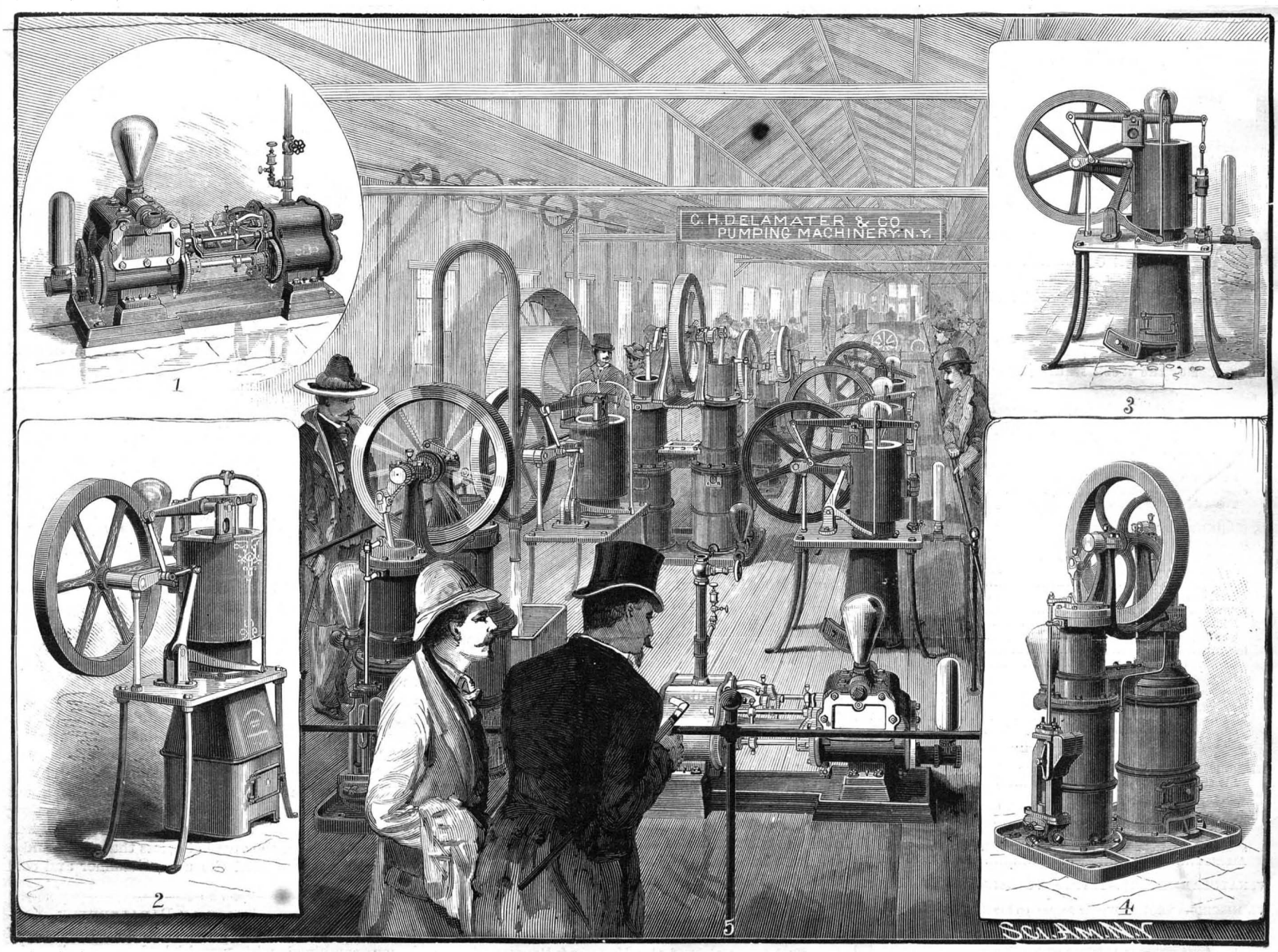
The *Ericsson* hot air pumping engine is a single cylinder engine in which are two pistons, one called the "main" or air piston, which receives and transmits the power, and the other is called the "transfer" piston, the office of which is to transfer the air contained in the machine alternately, and at the proper time, from one end of the cylinder to the other.

The cylinder is provided at its upper end with a water jacket, through which all the water passes on its way from the well to the tank. This keeps the upper end of the cylinder cool, while the lower end is exposed to the fire and becomes as hot as is practicable to make it. By the peculiar arrangement of connections between the air and transfer pistons, the proper relative motions between these pistons are obtained. The operation is as follows: After the lower end of the cylinder has been sufficiently heated, which usually takes only a very few minutes, the engine must be started by hand, by giving it one or two revolutions. The air contained in the machine is first compressed in the cold part of the cylinder; it is then transferred to the lower end, where it is instantly heated and expanded, thus furnishing the power. This engine, like all other hot air engines, is only single acting. The momentum of the fly wheel continues the revolution until it receives an additional impulse by the repetition of the above mentioned conditions, which occur once in every revolution. The same air is used continuously, and is cooled, compressed, heated, and expanded in the regular order and without noise.

Figure 3 in the illustration shows one of these engines with a furnace adapted for burning coal, and Fig. 2 the same adapted for burning wood. Several of these engines are now at work in suburban residences, using wood for fuel, and the owners speak of them in the highest terms. As the furnace is small, the chips from the wood-pile can be used, and the fuel really costs nothing. For use in cities where a gas supply can be obtained, and the water has not sufficient force to flow to the tops of the houses, they are arranged with a gas furnace, as shown in Fig. 5. We are informed that this firm has sold in New York city alone several thousand of these engines, which are so simple and safe that their care is usually intrusted to the hands of the cook or the coachman. A great many suburban residences are unfortunately situated with respect to obtaining pure water, and the owners are obliged to resort to very deep wells, being often compelled to sink artesian wells to a depth of several hundred feet in order to obtain pure water for cooking and drinking purposes. One of these engines at the exposition is provided with a very neat and suitable device, by which the pump can be lowered down into the well a sufficient depth to reach the water, the engine standing on the surface, where it can be easily attended to.

Figure 4 is an illustration of the *Rider* Hot Air Pumping Engine. For the present these engines have only been adapted to using either coal or wood as a fuel. They are somewhat more expensive than the engines previously mentioned, and are intended to do more severe work. This style of engine is extensively used in the large flat houses in this city, and also in the numerous summer hotels at the watering places in all parts of the country, and great numbers of them have been exported to different foreign countries. They are

(*Continued on page 277.*)



EXHIBITION OF PUMPING ENGINES BY C. H. DE LAMATER & CO. AT THE NEW ORLEANS EXPOSITION.

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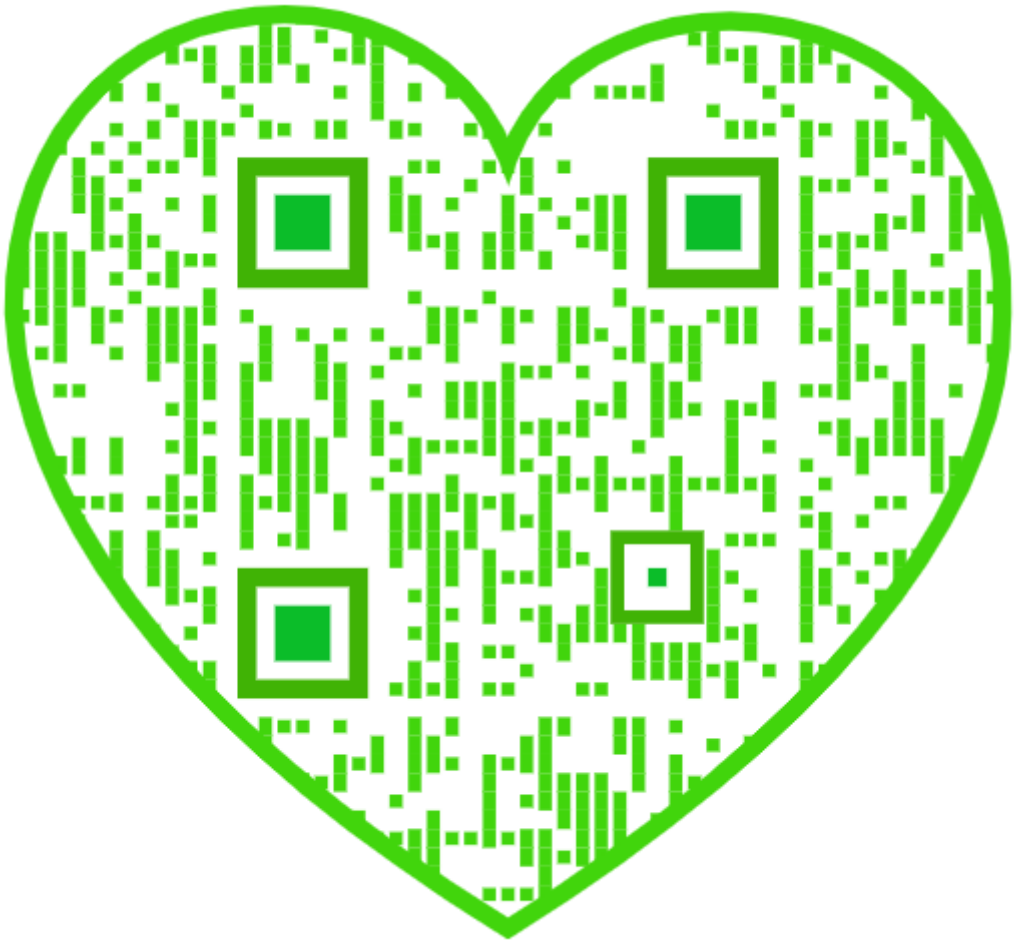

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included.....$3 20
One copy, six months, postage included..... 1 60

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NEW YORK, SATURDAY, MAY 2, 1885.

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TRADE MARKS AND LABEL REGISTRATION.

In former issues of this paper we have discussed and criticised the action of the Commissioner of Patents, in refusing label registration to what he judged to be proper subjects for protection as trade marks. The case of the Willcox & Gibbs Sewing Machine Co. was then cited by us as the great decision on which the practice of the Office should be based. This decision, together with another unreported case, in which a mandamus was granted, sufficed to change the practice in the days of Mr. Butterworth's predecessor, and we held that it should have been the rule for his action also.

The Commissioner named above held that the opposite interpretation of the statutes was the true one, and believed that the Patent Office authorities should act as judges of the character of the device submitted for registration. To sustain this position, the text of the statute was appealed to. The refusal to comply with the rulings laid down by the Supreme Court decisions in the Willcox & Gibbs and Schumacher & Ettinger cases was justified on the grounds that the case had not been fully presented by the former Commissioner, his counsel. This was equivalent to saying that the cases alluded to went by a sort of default. The fallacy of this suggestion of default is shown by the fullness of the opinion rendered in the one now reported, the Willcox & Gibbs Sewing Machine Co.'s application. It was unusually long, and showed how thoroughly the case had been studied by the judges of the court to whom application for the mandamus had been made, the Supreme Court of the District of Columbia.

Thus matters stood during most of the incumbency of the last Commissioner. The views of the Supreme Court, so fully expressed in one case, and confirmed by their action in a second, were of no avail to determine the practice of the Office. This practice could not be justified by either of the cases alluded to.

The subjects of trade mark or label registration, as a rule, are not of the highest importance. They cannot, on the average, compare for interest or value to their movers with cases involving patented structures.

The Bell telephone patents and the barbed wire patents are held to be worth many millions of dollars. No label or trade mark can approximate to such a value. Yet labels and trade marks are of importance and interest enough to render the Commissioner's action in discriminating within the Office between them very annoying to such as believe his action unjustified by law. Considerable friction between applicants for registration of designating designs and the Patent Office has for some time past been in existence. Both counsel and the Commissioner of Patents have doubtless wished that the question were disposed of in one way or the other.

At last a case (Moodie vs. Butterworth) was brought to trial, in which a mandamus was applied for from the Supreme Court of the District of Columbia, and was refused by that tribunal. The decision was rendered but a short time before the change of Commissioners, and to a certain extent stamped with the seal of court approval the existing practice of the Office. That this interpretation was put upon it by the Commissioner is evident from the way in which notice of it was published in the *Gazette*. A report of the decision was printed as a statement in the *Official Gazette* of January 6, 1885. The date of the decision was December 27, 1884. The necessity for thus printing it as a "statement" arose from the fact that the court delivered no written opinion in the matter, and full reports of its voice are not on record. A mandamus was refused. This is all that the "statement" could positively assert about the attitude of the court. Its definite conclusion or opinion is not given. The case seen in this light forms a very imperfect offset to the written opinion rendered in the former suit. The published statement of the decision could not go behind the record, and that was merely a mandamus refused in a particular case. The refusal justifying the Commissioner's action in this suit was cited in the *Gazette* in support of his views as to all cases. But the question, just as before, is open to discussion. We do not see how the arguments stated in the Willcox & Gibbs case can be thus lightly disposed of.

Recognizing the fact that every decision in this vexed question was of importance, and regretting that no expression of the court's opinion was accessible, we have succeeded in obtaining the private expression of several of the District Supreme Court Judges' opinions in relation to trade marks and labels. This interesting record we lay before our readers in the present issue, commending it to their careful reading. It will be seen that it does not by any means make the Moodie case a conclusive one. In this suit a mandamus was refused. In other words, the Court adopted a negative action, owing to the trouble of satisfactorily interpreting the statute. The bench of judges acknowledge a difficulty that the Patent Office authorities profess to have no trouble in disposing of.

Mr. Butterworth, after a full experience of the duties of the Commissionership of Patents, takes his seat in Congress as member of the House of Representatives. It is possible that in this capacity he may try to do something to secure a better expression of the trade-marks and label registration statutes. Such action would be welcomed by all, and the ex-Commissioner's special experience, backed by his legal attainments, would do much toward securing a better state of things. Nothing is so productive of ill in the matter of enactments as uncertainty. The uncertainty of the label and trade-mark statutes apparent on their faces has only been reaffirmed, and in no sense done away with, by the simple decision of the Supreme Court Judges in the Moodie case.

In a recent article on Patent Office examinations of novelty, an allusion was made by us to the departure from the spirit of the opinion in the Wilcox & Gibbs case, in the Patent Office practice in examining labels and trade marks. This has called forth a lengthy and very able communication from the Examiner of Trade Marks. In it the writer cites the Moodie case, and reaffirms the propriety of the Office practice. In considering our article as directed toward his division of the Office he is entirely in error. It is intended to apply, as indicated by its title, to the practice in the Department of Patents. We incidentally remarked that compliance with the views of the Supreme Court was not to be found in the practice followed in label and trade mark registration. His arguments in rebuttal of this statement are based largely on the Moodie case. This should be only regarded as an implied opinion in a single individual case. The communication alluded to will be found printed at length in the SCIENTIFIC AMERICAN SUPPLEMENT of this week, No. 487.

RUST CEMENT.

One of the most adhesive and durable of cements known to mechanics who essay to unite iron surfaces is the oxide of iron itself; with this a joint can be made so perfect and sound that the iron will break before the cement will part. In removing the cast iron pipe of a bilge pump from a ship that had made four Atlantic voyages, it was necessary to take the sections apart. The flanges had been pasted with a cement of cast iron drillings and filings, mixed with sulphur and sal ammoniac, moistened with water. Then the nuts—three in each flange—were set up on the bolts, and the union was completed. The four voyages—going and returning—occupied nearly a year. When the separation of the parts was attempted, even the cold chisel was unable to make a division between the solid castings and the intervening cements. The sulphur and ammoniacal salts are simply means to more rapidly oxidize the iron drillings and filings—the iron rust is really the cement. If time is allowed, ordinary water or salt water would act as a solvent.

All our iron ores are simply oxides, and when they are exposed to the atmosphere they show the ordinary color of iron oxide—red. This oxide gives the red color to the "brownstone" (red sandstone) so much affected for building purposes. These stones are only sand cohered in mass by iron rust. Their formation can be witnessed even now on some of the New England beaches. The narrow and slightly raised windrows of sand thrown up by some heavy storm or some very high tide, so that they are beyond the redestroying effects of common tides and ordinary winds, can be noticed slowly solidifying. Fragments may be gathered which are only sand slightly held by the oxide, but others may be found which are embryo stone—if such a term may be allowed—solid to the feeling, and capable of being thrown as missiles. Beyond these are the shingles of the beach and the cliffs that define the shores. In olden time this sand and this iron was mixed, subjected to pressure by outerlying layers, and at length became "solid rock," as we call it. And yet this quarried rock of sand cemented with iron is still somewhat soft, and for building purposes requires seasoning—the gradual reabsorption of the water given by the atmosphere; and this water is essentially salt, or it has the oxidizing effect of salt water, for its effect on iron is similar to that of salt water on iron under similar circumstances.

It is evident that any substance that induces rust in iron is not a safe one to use in connection with permanent structures of iron. Some years ago an instance of iron in connection with red sandstone—brownstone—was noticed, where wrought iron rods were secured into steps of brownstone. The stairway was removed, and the iron in the stone was disintegrated into mere threads. In this instance the holding of the iron balusters was sulphur. And sulphur is much worse than lead; it is impossible to secure iron in stone, or even in iron, by sulphur. Lead is perhaps as safe as any material that is not too expensive to use. In removing an iron fence, the embedment of the palings in lead, lining the holes in the stone, making a superficies of about fourteen inches, was readily overcome by lever action; while the cross section of the same paling through iron rails, iron on iron, the area being less than three and a half inches, necessitated the use of hammer and cold chisel.

TO DISGUISE THE TASTE OF PARALDEHYDE.—Sutter (*Arch. d. Pharm.*) finds rum and tincture of lemon combined with paraldehyde make it palatable.

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VIEWS OF THE DISTRICT OF COLUMBIA JUDGES ON TRADE-MARK AND LABEL REGISTRATION.

The following has been furnished to us for publication by a prominent member of the Washington bar, who personally followed up the matter at our request:

The question of the power of an applicant to the Commissioner of Patents, for the registration of a label, to determine for himself whether the design he presents shall be considered a label or a trade mark, and the further question as to whether the duty of registration involves the exercise of some judicial function or merely a purely ministerial action, has been decided by the Supreme Court of the District of Columbia in a more recent case than the Willcox & Gibbs sewing machine case.

The case referred to is that of the United States ex rel. Schumacher vs. Marble, which will be found in 3 Mackey 32 (not yet published.) The following is a copy of the decision of the Chief Justice, who delivered the opinion of the Court in the latter case, taken from the advanced sheets of said report:

"It is objected in behalf of the Commissioner of Patents that the act of Congress of June 18, 1874, providing for the registration of labels is unconstitutional, and therefore void.

A very elaborate, ingenuous, and perhaps, under appropriate circumstances, successful argument has been made to sustain this position.

But we think the point raised has no application to this case. We do not think it lies in the mouth of a government official to call in question the constitutionality of a law directing him to perform a purely ministerial duty.

If the question was raised between other parties, as, for instance, in a suit for infringement in the use of a label, and the constitutional rights of the parties were involved in it, that is to say, whether one man was prohibited from using it because another man had registered it as a label, the argument might be pertinent, but we do not think it is a question which can be raised here.

The next reason assigned by the Commissioner for his refusal to comply with the petitioner's demands is that the design offered for registration is a mere fanciful sketch, which, while it may be used as a trade mark, has none of those descriptive features about it characteristic of a label.

A label, it is contended, consists of a pictorial representation or a written description of the article to which it is affixed; and that a fancy picture, such as this, having no connection with its proposed use or application, cannot be registered as a label. This question has been settled by this Court in the case of the Sewing Machine Company vs. Marble. We decided in that case that the duty of the Commissioner of Patents, on the application to him to register a label, is a purely ministerial one, as much so as the act of a recorder of deeds in placing upon public record a muniment of title. The statute has not defined what shall be considered a label, whether it shall be a picture or a writing; whether it shall be descriptive of the article to which it is affixed, or whether it may be a mere arbitrary design. If the applicant presents it as a label, and appeals to the Commissioner to give it the protection which the law provides for it as a label, the duty of the Commissioner is to register it, and in doing so he gives it only the protection which the statute provides.

It is not protected as a trade mark, nor as a copyright. The public at large may use and enjoy it, but *qua* label it is restricted to the use of the party who has registered it for that purpose and no other; with the character of the device the Commissioner is not at all concerned. His function is as purely ministerial as it is capable of being. The writ will issue.

In reference to the case of U. S. ex rel. Moodie vs. Butterworth, No. 25,748, at law, docket 30, in the same court, it appears from the record that a petition was filed by Moodie for a mandamus to the Commissioner of Patents to require him to register a label, registration having been refused by the Commissioner, after investigation, because the alleged label did not contain subject matter which could be registered under the statute as a label. This petition was filed on the 4th day of November, 1884. On the 10th day of November a rule to show cause why a mandamus should not issue was passed, and on the 8th day of December the answer of the respondent was filed.

Here the record stops; and no decision, as far as the record is concerned, appears to have been made by the court.

An interview with one of the counsel for the relator disclosed the fact that the court had made a decision, and had decided not to issue a mandamus. Counsel stated that Chief Justice Cartter, with Judges McArthur and James, heard the case, and that Judge McArthur delivered the opinion of the court.

Counsel further stated that Judge McArthur took the ground that the device shown was not a label, and that the Commissioner of Patents had the right to determine whether it was a label, and that the other members of the court differed with this view, but said that owing to the uncertainty of the statutes they would in the case before them discharge the rule. Chief Justice Cartter said that he had no doubt about the law on the subject, and still entertained his former opinion. The Commissioner of Patents had the right to decide that a thing, described as a label or trade mark by an applicant, but really of an entirely foreign nature, as a bomb shell, torpedo, or a battering-ram, could not be registered, but that a man had a right to call a trademark a label if he felt so disposed, and the Commissioner of Patents, when requested, would be bound to register it, The Chief Justice further said that the court sometimes, in matters of writs of mandamus, exercised their discretion and refused the writ, and that in the Moodie case the court had taken that course, but that the court had not reversed its former rulings.

Judge McArthur, who delivered the opinion in the Moodie case, said that he had held in that case that the Commissioner of Patents had the right to inquire, upon an application being made to him for the registration of a label, into the character and design of the label, and that if the Commissioner found that the proposed label contained matter properly registrable as a trade mark, and that the proper fee had not been paid, he would have the discretion to refuse registration of the device offered.

Judge McArthur further said that the Chief Justice had had some difficulty in agreeing to the judgment discharging the rule, owing to a former decision made by him, but that the Chief Justice had finally concurred, although not on the same grounds, with the judgment of the court discharging the rule.

Judge James, who delivered the opinion in the Willcox & Gibbs sewing machine case, said that the whole question was in a cloudy and uncertain state, and that the statutes were not in a condition to admit of a lucid exposition of the law, and that additional legislation was needed on the subject. The Judge said that in the Willcox & Gibbs case he had held that the duties of the Librarian of Congress in the matter of registration of labels had been transferred to the Commissioner of Patents, and that his duties were simply those of the Librarian, but that he had recently changed his views somewhat, owing to the want of clearness in the statutes affecting the subject; and that he was now of the opinion that the Commissioner of Patents had more power than had been vested in the Librarian of Congress, but to what extent the power of the Commissioner of Patents went he was not prepared to say. The judge further said that he did not agree with the views that Judge McArthur had announced in the Moodie case, but that owing to his own change of opinion somewhat, and in view of the difficulties surrounding the case, and also in view of the fact that it was in the discretion of the court whether such a writ as a mandamus should issue, he had concurred in the judgment of the court discharging the rule to show cause.

Compressed Air Power.

At Guinnesec Falls, Michigan, the water power is used to compress air, which is conducted through a 24 inch pipe to the iron mines, a distance of three miles, where it is used for operating pumps, engines, and drills in place of steam. The head of water at the falls is 47 feet, and drives three turbine water wheels, each of which operates a pair of air compressors, and the whole plant has been in satisfactory operation for over a year. One of the earliest instances of the application of air on an extensive scale in the operation of drills was, says *Engineering*, in the excavation of the railway tunnel, 28,081 feet in length, which pierces Hoosac Mountain, situated in western Massachusetts, where a rapid river at the eastern terminus furnished the water power which was used to compress air which actuated the drills, while the exhaust served to ventilate the tunnel. Several years ago the manager of the cordage works at Plymouth, Massachusetts, introduced an air locomotive which took the place of some sixteen horses and an equal number of men employed in transporting material from one department of the establishment to another.

The risk of fire prevented the use of a steam locomotive in these ropewalks and mills. The air passes from the reservoir, which takes the place of a boiler, through a reducing valve into a receiver, where the pressure is maintained at 90 pounds per square inch. Thence to the cylinders, where it is used like steam, except that the refrigeration produced by the expansion of the air is so great that it is necessary to use very limpid oil for lubrication on such places. The compressed air is furnished from a receiver of boiler iron, which supplies a system of underground pipes, with hydrants at convenient places; and when the air supply at the locomotive is becoming low, it is stopped near one of these hydrants, and a hose with a snap coupling attached, and the air supply replenished with little delay. At one of the fairs of the Charitable Mechanics' Association in Boston, the management forbade any fires in the building; and as a consequence, the exhibitors of portable engines considered that they were deprived of opportunities of showing the operation of their class of engines. One exhibitor showed resources equal to the occasion, for he connected the exhaust pipe of one engine in his exhibit to the boiler of another of his engines, removed the safety valve, and connected the flywheel by belting to the shaft which was kept in motion by the main engine of the exhibition. This method of driving an engine furnished a supply of compressed air into the second boiler, whence it was used for motive purposes. Soon the manager learned that these portable engines were in operation, and assuming that the regulations concerning fire were necessarily violated, sent a worthy colored messenger to examine and report the facts to him. After looking these engines over very carefully, he reported that they were running the engines in question with the "northwest wind or something or other." A group of laborers were examining the engine, and one of them gave his opinion that "cold steam and no fire was the greatest invention yet."

The Education of the Artisan.

Professor Huxley says: For myself, I look upon simple knowledge by itself as of far less importance to the artisan in his career in life than a number of other qualities. I do not say that knowledge is not an extremely good thing; but if a man is to make a good workman, or to do anything in practical life, you must give him an education that fits him for the conditions of life with which he has to deal, and you will not give him that education by filling his head with a number of intellectual abstractions, or even by giving him the largest acquaintance with scientific principles. And I think it is a profound mistake, considering the career to which the majority of artisans or persons in that class of life are necessarily bound, ever to take them out of the wholesome discipline of practical contact with the realities of life, for the mere sake of giving them a greater or less amount of knowledge. A man who is inclined to do so may always pick up knowledge, and he may do so at the same time that he is getting his education, in the highest sense of the word, out of his contact with the realities of his daily life; but if you make a bookworm of him, if you take him away from all that contact with reality and turn him back afterward into it, he has lost touch of life.

I speak with the greatest hesitation, because I have nothing to do with industrial pursuits; but I have had to do with mankind in many stations in life, and it seems to me that what is wanted in a foreman is a man of energy, punctuality, business habits, and power of dealing with men, all of which things are not to be got out of books or laboratory work. These qualifications are the most essential qualifications in a foreman, and what you want besides in such a man is not book learning, but an intelligence sufficiently trained to be able to deal with new conditions, and an amount of knowledge sufficient to enable him to know where to go to find more if he wants it.

Columbus, Ga., Waterworks.

At a recent meeting of the Engineers' Club of Philadelphia, the secretary presented, for Mr. Jacob H. Yocum, an illustrated description of the recently constructed waterworks at Columbus, Ga., which city has a population of 25,000. The Chattahoochee River was investigated as a source of supply, but on account of the expense of filtering after its frequent freshets, and of pumpage, it was abandoned, and a gravity system adopted. Among the adjacent hills was found a pure and soft water, delivered through the gravel beds, and a gathering ground of 12 square miles, which would yield, after allowing 50 per cent for absorption and evaporation, a daily supply of 15,000,000 gallons. The water is impounded in successive dams, respectively 130½ and 115½ feet above the center of the city. The upper dam is 266 feet long by 21 feet high; area, 20 acres; capacity, 100,000,000 gallons. The lower dam is 250 feet long by 21 feet high; capacity, 20,000,000 gallons. The forest ground they occupy was carefully cleared, grubbed, and surface removed to the gravel and clay. The discharge of upper into lower dam is arranged with reference to aeration of the water.

The water is conveyed to the city by 18,000 feet of 12 inch main, which divides at the river into two 9 inch wrought iron pipes laid under the floor girders of a bridge 800 feet long. These pipes unite in a 12 inch main again upon the city side. It is intended to substitute a submerged main for this double pipe. The distribution consists of 10, 8, 6, and 4 inch cast iron pipes, fitted with the Cassin double fire-hydrant and the necessary valves. A 1 inch jet can be thrown 85 feet. At the opening test seven streams were thrown 75 feet simultaneously. The works provided abundance of pure, good water during a four months' drought, and have generally exceeded expectations. An additional 400,000,000 gallon reservoir is, however, contemplated to meet prospective requirements.

The Inventions Exhibition, London.

The forthcoming exhibition, which opens May 4, is to be magnificently illuminated at night by means of electricity. Ten thousand lamps are to be employed. Of these, 464 are arc lamps and 5,530 incandescent lamps for the exhibition proper, the remainder for the grounds. Eighteen steam boilers will be employed, capable of evaporating 110,000 lb. of water per hour.

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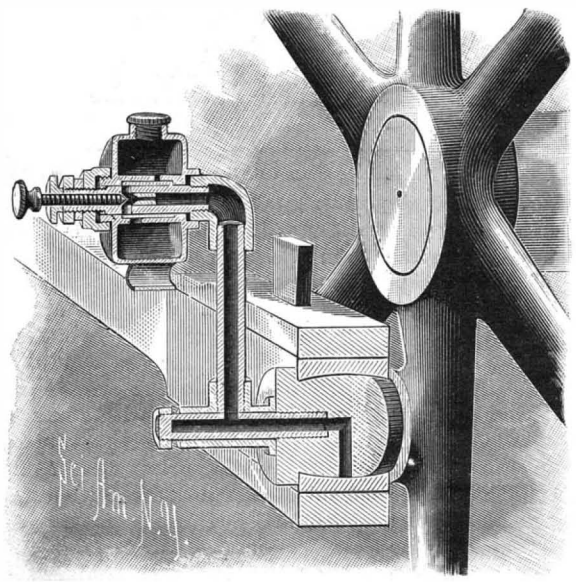
AUTOMATIC OILER FOR CRANK PINS.

The crank pin is formed with an aperture upon the axial line extending inward from the face, and thence at a right angle to the outer bearing surface. Screwed into the aperture is a hollow plug, to which a tube is attached at a right angle. On the outer end of the tube is a quarter bend that carries the oil cup and its parts. The oil cup is of cylindrical form, and is provided with a feeding cap at one side. At its center it is formed with a transverse tube forming a sleeve around a fixed tube screwed into the end of the quarter bend. The sleeve and tube are provided with apertures to allow the oil to pass through the tubes to the plug, so that a continuous passage is formed for the oil from the cup to the crank pin. The cup has an annular flange fitting over the quarter bend, and at its outer side is a similar flange that is threaded and receives a packing gland whereby the ends of the tube are made tight.



HARTNETT'S AUTOMATIC OILER FOR CRANK PINS.

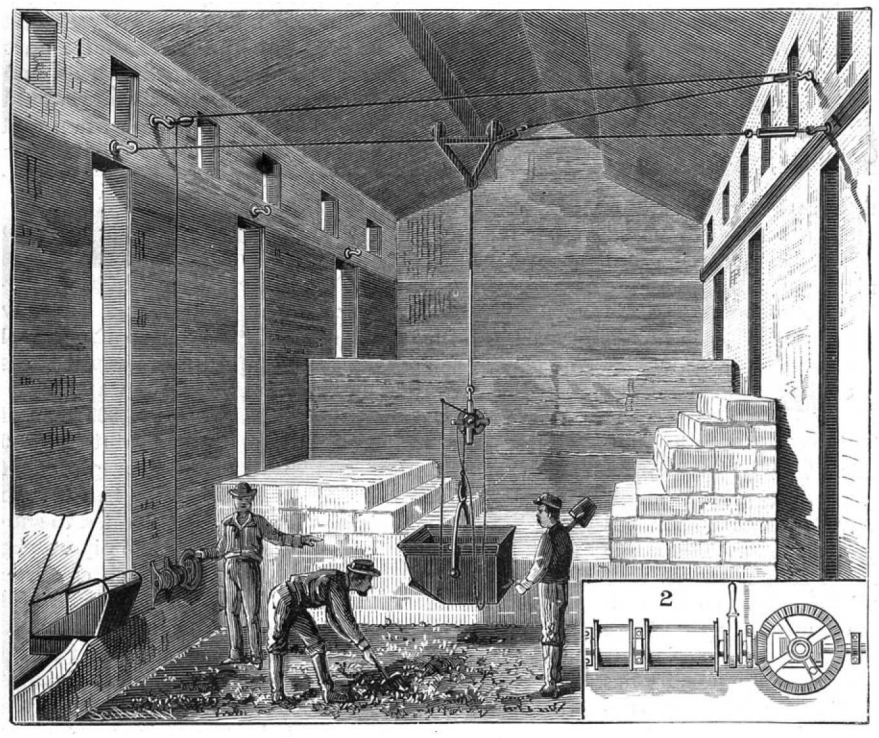
The outer end of the inner tube is screw-threaded and furnished with a set nut taking against the gland, so as to hold the cup up to place; and in the outer end of the tube is a screw plug that can be screwed in to more or less close the aperture, and thus regulate the escape of the oil. The tube holding the oil cup projects from the center line of the shaft, so that in the rotation of the crank pin the oil cup simply rotates with the shaft, while the plug in the crank pin, moving with the latter, a centrifugal movement of the oil is set up from the cup through the tubes to the crank pin, thereby keeping up a constant and uniform supply of oil that can be regulated according to the amount desired. In order to fill the cup while the engine is running, it is only necessary to take hold of it to prevent its rotation with the tube, when the cap can be removed. A loop on the under side of the cup is for convenience in taking hold of it to stop its rotation. In the space between tube and sleeve is a wire cloth, which, while allowing the oil to pass freely, prevents any sediment from finding its way to the bearing.

Additional particulars regarding this patent may be obtained from the inventor, Mr. John M. Hartnett, of Lyons, Kansas.

HAND POWER APPARATUS FOR HOISTING AND CONVEYING BROKEN ICE, ETC.

The invention herewith illustrated shows an improved arrangement for hoisting and conveying purposes, which has been recently patented by Mr. Henry B. Conger, of Burlington, Vt. It is more especially designed for conveniently and rapidly removing valueless pieces or clippings of ice, as they accumulate in ice houses, to a point where they can be readily carried away, a work heretofore generally performed by hand barrows and dump sleds, slowly and expensively.

According to this invention, an inclined wire cable or rope is suspended from any point within a building to a point above or near the dumping spout on the other side, the cable supporting a traveling carriage, from which a bucket is so suspended that it can be easily raised or lowered and dumped automatically at the spout. The lower end of the cable is attached to a stationary hook over the dumping chute, but the other and higher end is connected to one extremity of a turn buckle, attached to an adjustable hook, whereby the cable is kept taut, and this hook is adapted to slide in a grooved bracket, extending longitudinally along the opposite side of a room or building. The invention covers special details whereby this hook may be easily located, and then securely fixed at any desired point in the sliding bracket. Suspended from the carriage which travels on this cable is an iron rod, on the lower end of which is a differential pulley supporting a bucket by means of a chain and bail, the latter so adjusted as to hold the bucket upright while it is being filled and moved, until the bucket is tilted and its contents dumped into the spout by its toe coming in contact with the nose of the spout, from the rapid movement of the carriage with its suspended bucket down the inclined cable. To haul the carriage up the cable, the hauling rope passes over the larger of the two drums shown in Fig. 2, the shaft carrying these drums being attached to the side of the building. The smaller drum carries a special cable for use in tilting the bucket when this apparatus is to be put to some different employment; the length of the dumping cable is then regulated according to where the load is to be deposited, and it can be so adjusted that the contents of the bucket may be distributed over a greater or less space as desired. The carriage with its bucket is drawn up the inclined plane by a crank on the gear wheel shown in Fig. 2, and is held while being filled by a friction brake on the larger drum, the bucket being lowered and raised by means of a differential pulley; the brake being loosened, the weight upon the hoisting rope rapidly reverses the movement of the drum, when the bucket runs down the cable and dumps itself. This apparatus, as will be readily conceived, can be used in the building of railroads by extending the wire cable over tripods at each end and made fast to the ground, conveying the earth for cuts and filling of ravines, doing away with horses and carts; also for building trenches for sewers and water pipes, first by opening the trench and commencing laying of pipe, and then extending cable as before, taking out the earth and dumping back on pipe, thus handling the earth but once; also for conveying from one building to another, and, in fact, in connection with nearly all kinds of excavation, being especially advantageous where it is desirable to lift and remove earth to a distance, it being claimed that it is thus practically applicable up to 600 or 700 feet.



CONGER'S HAND POWER APPARATUS FOR HOISTING AND CONVEYING BROKEN ICE, ETC.

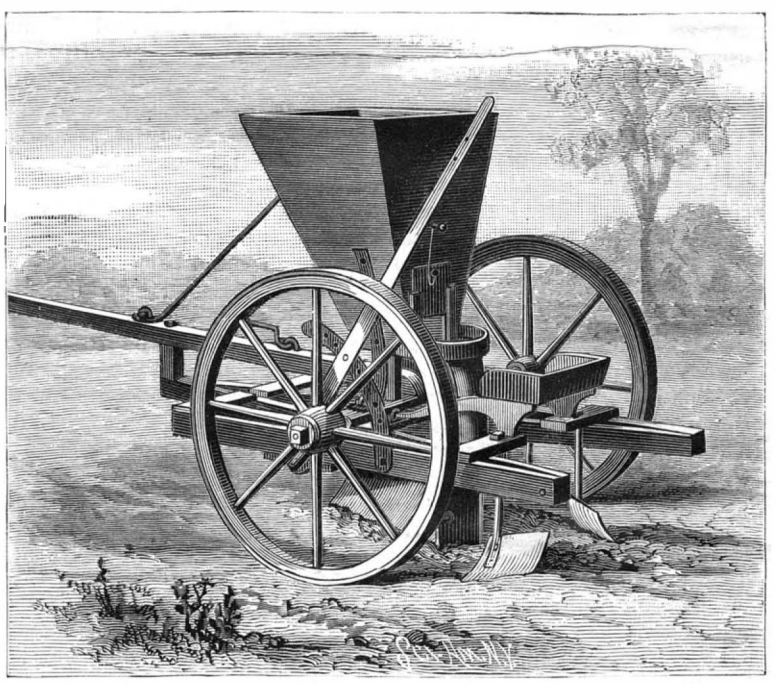
Solidification of Nitrogen and of Carbon Monoxide.

Nitrogen is solidified at a temperature of —214° and under a pressure of 60 atmospheres, its critical point being —146° under the pressure of 35 atmospheres. By carrying the rarefaction to 4 mm. of mercury, the author has succeeded in obtaining a temperature of —225°. The solidification point of carbon monoxide is —207° with a pressure of 100 m. of mercury. Oxygen stills remains liquid at a temperature considerably below —211°.—*Olszewski.*

COMBINED POTATO AND TREE PLANTER.

The engraving shows a planter designed to facilitate the planting of potatoes and small trees and to promote accuracy in such planting. The axle is bent at the inner side of each wheel so as to form a crank, the straight middle part of which rocks in bearings attached to the side bars of the frame of the machine. To the inner sides of the rear ends of the side bars are secured the ends of two bars whose forward ends are secured to each other in the central line of the machine. The forward parts of the side bars are connected with the inclined bars by short cross bars, and the rear parts are connected with the inclined bars by short bars whose inner ends project to serve as supports for the standards of the covering plows. The end of the tongue is secured to long cross bars attached to the side and inclined bars a little in the rear of the middle part of the axle.

The upper end of the plow standard passes through the forward long cross bar and tongue, so that it serves as a bolt for securing the latter in place. The forward edge of the standard is made sharp to act as a colter, and formed upon its lower end is a plow. Suitably connected to the opposite sides of the rear part of the standard and to the frame are plates, the rear parts of which, by means of a right and left screw working in U-shaped keepers secured to the inner surfaces of the plates, may be moved further apart or nearer together, according as a wider or narrower channel may be required. Secured by nuts to the inner ends of the short rear cross bars are standards; by adjusting the nuts the covering plows can be adjusted to work deeper or shallower in the ground. The covering plows are made in the form of mould boards arranged with forward ends inclined outward.



HAMRE'S COMBINED POTATO AND TREE PLANTER.

The seed hopper is made with inclined front and sides and vertical back, and the bottom is secured to the top of a pedestal, the lower end of which rests upon the forward cross bar and is recessed to receive the tongue. The hopper is so secured that it can be readily detached from the frame, together with its attachments. In the lower edge of the back of the hopper is the discharge opening, which is provided with a gate. Attached to the gate is a cord which may be wound around a pin to hold the gate at any height to regulate the discharge of seed. The bottom of the hopper extends rearward to form a feed platform, which is rounded and formed with a flange to prevent the potatoes from rolling off. In the outer part of the platform is an opening leading to a spout made of such a length that its lower end enters the space between the rear upper parts of the plates. The dropper's seat can be easily removed when necessary. To one of the crank arms of the axle is rigidly attached the end of a lever, by which the machine can be readily adjusted to open a channel of the required depth, and to raise the plows from the ground for convenience in turning round. The lever is locked in position by a pin passing through holes in the lever and in a curved catch bar. To the inner side of the outer part of the lever is secured a strap which engages with a headed pin on the side bar of the frame, to hold the lever in position when lowered to raise the plow from the ground. When the machine is to be used for planting trees, the hopper and its attachments and the seat are detached, and the young trees are placed upon the machine or in a box on the frame. As the machine is drawn forward an attendant places the seedlings singly and in the proper places in the furrow between the plates, and soil is thrown around them by the covering plows. This invention has been patented by Mr. E. J. Hamre, and particulars can be obtained from the Rev. J. G. Riheldaffer, D.D., Minnesota State Reform School, St. Paul, Minn.

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Toughened Filter Paper.

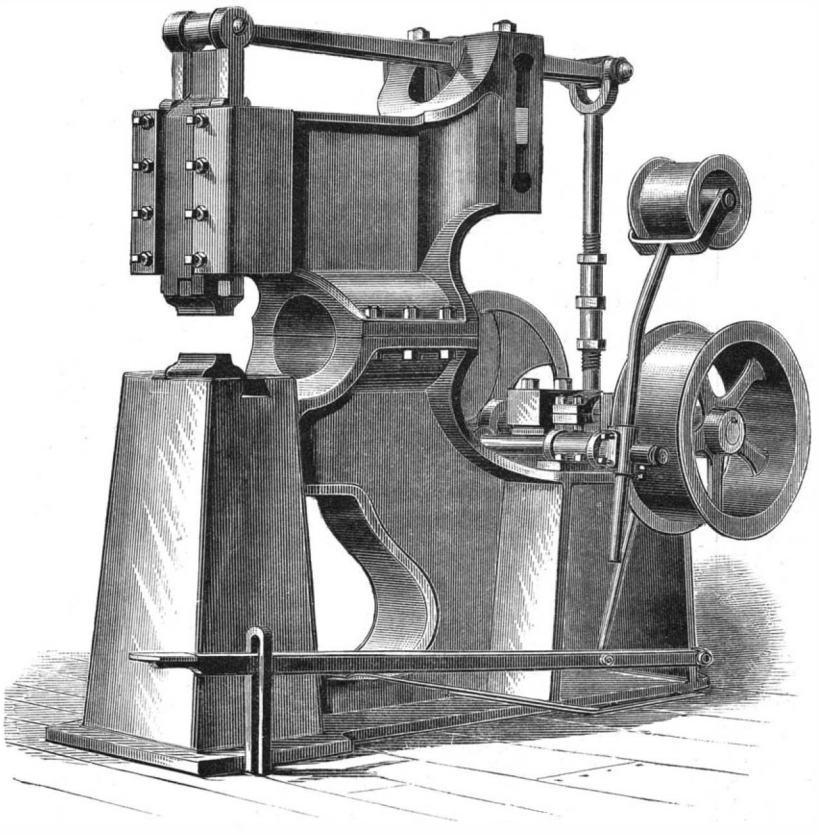
At a recent meeting of the Chemical Society a paper was read on "Toughened Filter Paper" by E. E. H. Francis. Filter paper which has been immersed in nitric acid, rel. den. 1·42, and washed with water, is remarkably toughened, the product being pervious to liquids, and quite different from parchment paper made with sulphuric acid. Such paper can be washed and rubbed without damage, like a piece of linen. The paper contracts in size under the treatment, and the ash is diminished; it undergoes a slight decrease in weight, and contains no nitrogen.

Whereas a loop formed from a strip one inch wide of ordinary Swedish paper gave way when weighted with 3 to 5 ounces, a similar loop of toughened paper bore a weight of about 3 pounds. The toughened paper can be used with the vacuum pump in ordinary funnels without extra support, and fits sufficiently close to prevent undue access of air, which is not the case with parchment paper. An admirable way of preparing filters for the pump is to dip only the apex of the folded paper into nitric acid, and then wash with water; the weak part is thus effectually toughened.

THE "VULCAN" CUSHIONED POWER HAMMER.

The hammer herewith illustrated presents several important features to commend it as one of the most useful of American machine shop appliances. The improvements it embodies are such as will be at once recognized by a hand accustomed to the use of power hammers, or who has had experience in the stamping out of work with dies, a branch of machine construction which is every day finding new channels of development. Its special adaptation for die work is a consequence of the fact that the ram moves in permanently fixed vertical slides, whereby it must necessarily descend each time in the same place, and deliver a true and square stroke. Perfect elasticity of stroke, with cushioning, are obtained by means of four rubber cushions, mounted above and below the fulcrum bearing of the helve, which is a solid steel forging, so that the latter is, in fact, mounted on elastic bearings. The effect of this arrangement is to almost double the stroke of the ram and produce a quick, sharp, and elastic blow. The ram, rebounding instantly, does not in the least chill the iron, as in the case of hammers resting on the work. The hammer, being constructed on the dead stroke principle, the helve is connected to the crank shaft by a connecting rod, the length of which may be adjusted by means of a right and left hand nut, so that the distance between the dies can be quickly increased or diminished, as desired. The force of the blow can be completely controlled by means of the treadle. The machine is built entirely of iron and steel, with the exception of the rubber cushions and the necessary brass work. This design makes it superior to any modification of the trip hammer, it being impossible, when the helve works on fixed pivots, to forge square when the work varies in size; but, as will be readily perceived, it is impossible to forge out of square with this hammer, no matter what may be the size or shape of the work, unless the dies are specially made. Expensive foundations are not needed, since the anvil is heavy enough to receive the force of the blow.

The perfect ease with which this hammer can be operated by the most ordinary workman, it simplicity of construction, and the rapidity with which a large class of work can be turned out with its help, are points which have been already well attested in a practical way in leading machine shops. It is adapted for all kinds of forging and die work, such as edge tools, agricultural implements, springs, machine forging, file makers, tool makers, etc. In the making of all these classes of goods, the exactness with which the hammer can be made to do its work, and the nicety with which its action can be controlled, are points which largely affect the amount of subsequent labor necessary in the finishing, as also the ultimate quality of the goods, and in these respects the hammer shown in the accompanying engraving has elements of superiority which practical men will unhesitatingly concede. The manufacturers of the Vulcan hammer are Messrs. W. P. Duncan & Co., of Bellefonte, Pa.

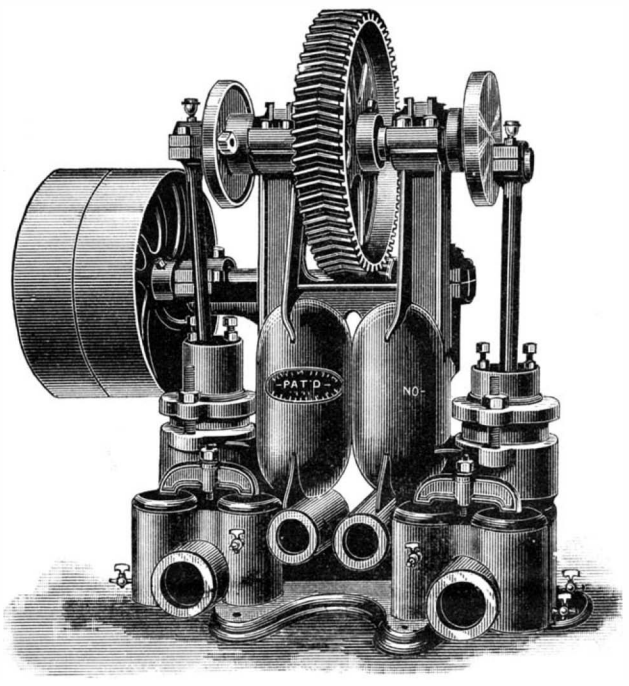


THE "VULCAN" CUSHIONED POWER HAMMER.

DR. EDWARD VANDERPOOL, of New York, recommends Fowler's solution of arsenic in neuralgia of the stomach, in six to ten drops three times per day. His experience with it appears to have been highly satisfactory in the cases reported.—*Independent Practitioner.*

DOUBLE PLUNGER GEARED PUMP.

The accompanying engraving represents a well designed and durable pump for feeding boilers or tanks, and for use in tanneries, paper mills, breweries, etc. The pulley shaft is mounted horizontally about in the center of the frame, and carries a pinion meshing with a large wheel journaled in the upper ends of the frame



DOUBLE PLUNGER GEARED PUMP.

standards. Owing to the form of teeth used, the action of these wheels is exceedingly smooth and noiseless, and the wear upon the contact surfaces is reduced to a minimum. The strength of the pinion teeth is increased by side flanges. At each end of the main shaft is a disk crank, finished on edge and face, and provided with steel crank pins made large to decrease the wear. The connecting rods are united to the crank pins by a cap and box, so that all wear can be easily taken up when necessary, and are fitted with brass oil cups. The lower ends of these rods are connected to the center of the plunger by a new device, designed by the makers of this pump, by means of which wear can be taken up by simply screwing up set bolts on the upper end of the plunger. The suction and discharge pipes, which are tapped to standard pipe threads, are clearly shown in the cut. There are similar openings for discharge pipes on the opposite side of the pump.

The air chambers are large, and are so disposed as to form part of the frame supporting the pulley and crank shafts. The valve seats—both the valves and valve seats are made of bronze metal—are screwed into the valve chamber. The removing of one nut permits both the suction and discharge chambers to be examined. The bracket supporting the pulley shaft is so formed that it can be placed at either side of the frame, as may be found most convenient in setting up the pump.

Practically, the machine consists of two separate pumps, which may be operated together or singly, and which may be used to pump different liquids at the same time. Both shafts are of steel. All the journals have oil boxes with covers to keep out dust and grit from the oil holes. The body of the pump and valve chambers have drain cocks, so that the pump can be thoroughly drained in cold weather. The pump is compactly and strongly built, occupies but a small space considering its capacity, and all its wearing parts are large and well proportioned, insuring easy running and durability. The journals are made large, and are filled with No. 1 Babbitt metal. Additional particulars can be obtained by addressing the manufacturers, the Stewart Heater Company, of 40 & 42 Clinton Street, Buffalo, N. Y.

The Phelps Induction Telegraph.

A most interesting, as well as wonderful, experiment in telegraphy was successfully tried recently by the B. & O. Telegraph Company officials. They succeeded in telegraphing on a railroad train while going at the rate of 40 miles an hour by the Phelps induction system. [This system was described in the SCIENTIFIC AMERICAN for Feb. 21 last.] The experiment was conducted by Mr. Phelps, the inventor, and under the direction of the B. &. O. officials. Messrs. Joseph G. Pangborn, the Assistant General Passenger Agent, and Mr. McLaren, the Manager of the New York city B. & O. telegraph offices, went on the car, and Mr. Weaver, the B. & O. electrician, remained at the receiving office in New York. The experiment was tried on the Harlem River branch of the New York and New Haven Railroad.

Soon after the train was started, and while going at the rate of 40 miles an hour, the operator in the car called New York. A direct wire had been furnished through to Baltimore and into President Garrett's private office in the Central Building in this city. The gentlemen in the car awaited the answer with anxiety. Soon the instrument began ticking as loudly as if in a stationary office. New York had responded. The induction system worked. Major Pangborn then indited a telegram to President Garrett, saying that the Phelps induction system was a success. The telegram went direct to Mr. Garrett, and an answer was received by the experimenters on the car: "Your telegram has been delivered to President Garrett in his private office." Major Pangborn then wrote another: "President Garrett, I am telegraphing to you, on a train going 40 miles an hour, by the Phelps induction system. The wire in our car is 7½ in. from the wire laid on the ties of the track." While the operator was sending the dispatch, Major Pangborn noticed that the train had gone its 12 miles, and that it would soon pass over the wire in the wooden trench. He said nothing, but let the operator continue. The train left the box behind. As it passed over the end there was a fainter sound of the ticking of the instrument, but the message continued. The induction was so strong that the current had gone to the wire on the telegraph pole 40 ft. from the track. It seemed marvelous to the experimenters. Sitting in a car with no wire nearer than 40 ft., and to send and receive messages! When the train returned the experiments were continued, and it was found that the inductor worked as well as on the other track. The message was sent over the wire in the wooden trench on the other track, 11 ft. away. Of course there was a difference in the sound from the one received and sent when the car was over the wire and when 11 ft. from it. On the return the telephone was connected with the induction system, and a message on a wire 60 ft. away was heard. The sender was in New York; and he was sending a message to his wife in New Rochelle: "I will not be home to-night. Business detains me in the city."

Mr. Phelps stated that a system of bells could be placed on the engines and worked by the induction system, so that trains could telegraph to each other, and a system arranged so that when trains were within 1,000 ft. of each other a bell would ring, announcing the number of the train ahead.—*Baltimore American.*

GALLIUM.—Dr. L. Ehrlich, a German chemist, has succeeded in isolating the metal gallium by an industrial process. A preliminary experiment has yielded 0·6 grain of gallium from 80 kilogrammes of zinc blende. The method followed was a modification of that introduced by M. Lecoq de Boisbaudran, which by lixiviation of the zinc sulphate resulted in a small quantity of mud containing ferric oxide and gallium. The galliferous alkaline solution was then electrolyzed in a platinum capsule, and the metal deposited in fine needles. As the melting point of gallium is low, about 30·5° C., and its luster brighter than that of mercury, it may be found of useful application by and by.

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Healing by Faith.*

It is not our purpose to deny, or even question, the verity of cures "by faith." The "mind" so acts on the body, and the brain plays so important a part in the nervous system, by which the whole organism is energized and controlled both in regard to its functions and nutrition, that it is not only quite possible, but an absolute fact, that many maladies which are not so far advanced as to be dependent upon changes in structure, or "organic diseases," may be remedied by or through the agency of the mind. We will even go so far as to affirm that a very large proportion of the ailing might be, and probably would be, sound if only they were sufficiently strongly impressed to believe themselves to be so. This influence of the mind on the body has been the stronghold of quackery from the earliest times, and "faith" is as powerful an influence for good or evil now as it has ever been. Such "miracles" as the Salvationists are working with their presage among the emotional classes, whether illiterate or well informed, have uniformly signalized the commencement of a new era in religious enthusiasm. When the first enthusiasm subsides, "miracles cease" of physico-mental necessity. The large class of so-called hysterical, cataleptic, and even epileptic affections are distinctly amenable to this influence; so are those nervous disturbances and derangements which consist wholly or chiefly in disorderly activity, as distinguished from actual disease. The mimetic maladies, of which there are always a very large number of cases, are, of course, amenable to the curative influence of faith. Outside these classes, however, stand a multitude of badly managed or misunderstood cases which only need to be placed on a new footing—it matters little what—to get well. A wondrous crowd of ignorant prejudices still hovers over many districts as to the curability or hopelessness of special diseases which are better understood and more successfully treated—on common sense principles—in the centers of knowledge.

For example, we know of localities and affections which, being associated, produce the most dire delusions as to the length of time bones usually take to unite in healthy subjects; and how coughs and other distressing maladies are, or are not, under the control of the will. In such combinations of facts and fiction, it is easy to get miracles out of such common matters as the union of the accurately applied ends of a fractured radius in three or four days! There is not a word to be said against "healing by faith." Every busy practitioner has cases under his observation that he would be heartily glad to find so powerfully affected that they could be cured even by this agency. All we are anxious to point out is that an intelligent lay press ought not to lend itself to the promulgation of nonsensical beliefs and impressions. Of course, it is true that many of the poor people who are reported to be "cured" are actually benefited, and by their faith. This is a fact, and there is no sort of reason why the benefits received should not be permanent. If the subjects of these cures are thankful to the Giver of all good, that is not a matter to make merry about. It is as it should be. We are glad of their gain, and pleased to find them moved to gratitude. Meanwhile, if these "cures" need be discussed, let the comments made be neither irreverent, offensive, nor puerile. The *modus operandi* of such recoveries is perfectly well understood, and there is nothing either specially noteworthy or wonderful about them.

New Torpedo Boats.

Yarrow & Co. are building for the Austrian Government a pair of large boats of what may be called the excessive speed class. The length is 135 feet and the beam 13 feet 9 inches. These boats are expected to run 24 knots within the hour when light, and 22 knots with gear on board ready for action. The engines are of the three-cylinder or triple-expansion type. The working pressure is to be 140 pounds, and the horse power is estimated at from 1,100 to 1,200 indicated. There will be but one boiler, of the usual torpedo boat type adopted by Messrs. Yarrow, and it will be a point of great interest to marine engineers, says *Engineering*, to see how far it is practicable to get so great a power from a single locomotive type boiler.

The dimensions of the first-class torpedo boats have been increasing of late, while the second-class, or original 60 foot boats, appear likely to become extinct, their place being taken by high speed pinnaces of somewhat larger type than those hitherto carried on war vessels. The improvements in machinery, and consequent increase in speed, enable these craft to be used for torpedo warfare, while they are to be at the same time available for ordinary ships' purposes. The first-class boats, of lengths from 100 feet to 110 feet, are undoubtedly fit to go through any reasonable weather, and such craft will always prove useful; still, by lengthening the boat from 130 to 140 feet, her powers would be greatly increased, while, generally speaking, no serious disabilities would be added. Of course, there is the question of cost, but the testimony of naval officers appears to be so completely in favor of the larger boat that the additional expense would no doubt be warranted.

* From the (London) *Lancet*.

COMBINED DETACHABLE POCKET AND CAP.

An invention recently patented by Mr. Andrew Heller, of 2095 Madison Avenue, New York city, provides a pocket for coats which can be readily detached and used as a cap. To the inner surface of the coat is sewed a piece of fabric, C, having a slot coinciding with the pocket slot, D. The edges of the slot in the piece are sewed to the coat at the edges of the slot, and the upper edge of the piece is sewed to the coat, the lower edge forming the tongue, F. The buttons, H and G, are sewed to the piece as shown in Fig. 2, and the sides of the pocket, A, are provided, at their upper edges,

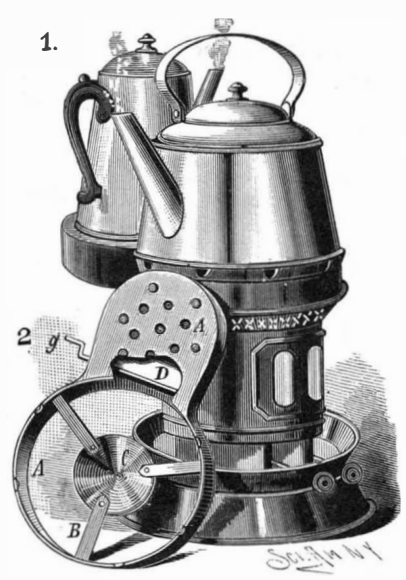
HELLER'S COMBINED DETACHABLE POCKET AND CAP.

with holes to receive the buttons. Cords are passed through the upper corners of the pocket, for the purpose of drawing the sides together when the pocket is held on the coat, or for holding the cap on the head.

As will be readily perceived, the pocket can be easily detached and then worn as a cap, the long side covering the back of the head. It can be combined with any coat, and would prove very handy for travelers, soldiers, and others.

HEAT DISTRIBUTER FOR OIL STOVES.

The invention shown in the accompanying engraving, recently patented by Mr. Benjamin Hunt, of Neosho Falls, Kansas, is designed to distribute the heat and flame of gasoline or oil stoves so that the heat will be applied equally over the bottom of the cooking vessel, thus avoiding danger of burning food from a concentration of heat at one spot. In the main part of the device are radial arms, B, whose inner ends support an inverted sheet metal cone, C. The extension is closed at the bottom by a plate, and at the top by a perforated plate formed with knobs upon its upper surface, for the purpose of slightly raising the vessel to permit the heat to pass out through the holes and come in contact with the bottom. The amount of heat ad-



HUNT'S HEAT DISTRIBUTOR FOR OIL STOVES.

mitted to the exterior can be regulated by a damper, D, pivoted in the entrance.

The device is placed upon the oil stove, so that the point of the cone will come in the center of the flame, and deflect and distribute the heat equally over the bottom of any cooking vessel which may be placed upon the upper edge of the main portion of the rim, A. The extension may be used when a slow heat is required. The utility, simplicity, and small cost of the device will recommend it to those using oil stoves.

A Dozen Hardy Shrubs.

To an inquirer in the *Rural New-Yorker* for the names of a dozen of the best ornamental flowering shrubs, Mr. C. E. Parnell, of Queens, L. I., replies as follows:

It is really a difficult affair to select a dozen only, for there are so many beautiful sorts, and all of them present so many claims to our notice, that it appears to be altogether unjust to neglect the many on account of a few. But as there are many who, like your correspondent, only desire, or have room for, a few, one cannot do less then make the attempt at a selection. First, I would choose Weigela nana variegata, one of the most beautiful shrubs in cultivation. It is of dwarf habit, with clearly defined variegated leaves of a bright golden yellow. The flowers, which are of a pale rose color, are produced in the greatest profusion early in June. Weigela rosea Desboisii is of erect, compact growth, and has deep rose-colored flowers in June. Spiræa Thunbergii is a beautiful low-growing shrub of rounded form, and has delicate green lanceolate foliage, and small white flowers, which are produced early in May in such profusion as almost to cover the entire plant. Spiræa Reevesiana is a very graceful, slightly drooping species, with white flowers; while S. callosa alba is a low-growing variety, producing its small, white flowers in large corymbs during June and July. Philadelphus coronarius is rather a long name for a very popular and well-known strong growing shrub that produces its large, pure white, sweet-scented flowers about the middle of June. Hydrangea paniculata grandiflora is so well known as to need no further description than to say that it is one of the best, if not the best, ornamental shrub we have in cultivation. Buist's Variegated Althæa is another choice variegated shrub, the leaves of which are beautifully marked with creamy white. It stands the sun well, is of free growth, and is attractive at all times. Then we must include the Golden Bell (Forsythia viridissima), which is well known as one of the earliest flowering shrubs, the bright yellow flowers appearing before the leaves. Deutzia crenata fl pl. alba produces its double white flowers in racemes four or five inches in length late in June, and is a shrub of vigorous growth; while D. gracilis is one of the most graceful of shrubs. It is of dwarf, compact habit, and the pure white flowers are most freely produced. The Persian Lilac (Syringa Persica) is a shrub of medium size, having small leaves and purple, fragrant flowers.

All of the above are perfectly hardy, and can be cultivated by any one, even by those who possess but little skill or experience, and, if properly cared for, they will prove very satisfactory. They are not rare or expensive, and nice specimens can be obtained at a very moderate price of any of our leading nurserymen.

Ginseng.

A parliamentary paper contains the account of a journey made by the Consul-General of Great Britain in Corea. Some interesting information is given with regard to the production of the famous drug ginseng, so prized as a tonic by the Chinese. It is grown from a seed which is sown in March. The seedlings are planted out in beds raised a foot above the level of the surrounding soil, bordered with upright slates, and covered in from sun and rain by sheds of reeds, well closed in except toward the north side, where they are left to open. In the first or second year the ginseng plant is only two or three inches high, and has only two leaves. It is transplanted frequently during this period. In the fourth year the stem is about six inches high, with four horizontal leaves standing out from it at right angles, and in the fifth year a strong, healthy plant has reached maturity, though it is more usual not to take it up until it has reached the sixth season. Ordinary ginseng is prepared by simply drying the root in the sun or over a charcoal fire. To make red or clarified ginseng, the root is placed in wicker baskets, which are put in a large earthenware vessel with a closely fitting cover, and pierced at the bottom with holes. It is then placed over boiling water, and steamed for about four hours.

Ginseng was for centuries regarded as a very elixir of life all over the East; and especially in China and Japan. Its properties were supposed to be miraculous, but they were generally supposed to be confined to the Corean ginseng But its enormous price put it out of the reach of the poorer classes. The wild ginseng of Corea has frequently fetched twenty times its weight in silver in China. The export from Corea is a strict monopoly, which affords a considerable revenue, and is said to be the king's personal perquisite. Death is the punishment for smuggling it out of the country. The total export is only about 27,000 pounds avoirdupois.

A Great Steamer.

The steamship Etruria, a sister ship to the Umbria, built by Messrs. John Elder & Co. for the Cunard Company, is now ready to leave the Clyde. Built of steel, her tonnage is 8,000 tons; she is 520 feet long, 57¼ feet broad, and 41 feet deep, the engines being of 12,500 indicated horse power. The Etruria is soon to leave Liverpool on her maiden transatlantic trip for New York.

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EXHIBITION OF PUMPING ENGINES AT THE NEW ORLEANS EXPOSITION.

(*Continued from first page*).

also provided with deep well pumps for artesian and other deep wells, are noiseless, and may be run by unskilled labor.

These engines have two cylinders, one of which is kept cool by the water in a similar manner as the *Ericsson*, and the other is heated. The compressing is done in the cold cylinder, and the expanding in the hot cylinder. The air is alternately transferred from one cylinder to the other, and in its passage it passes through a regenerator, which is situated between the cylinders. This regenerator is for the purpose of saving as much as possible of the heat which remains in the air after it has done its work and is ready to be cooled and compressed. It is composed of a series of thin plates placed on edge and having thin spaces between them. Through these spaces the air flows. The heated air on its way to be cooled heats these plates to a high degree, and consequently parts with the greater part of the heat contained in it. These plates remain heated until the air, after having been cooled and compressed, returns through them, when the plates give up the heat contained in them to the air. This arrangement effects a very great saving in fuel. These engines, like the *Ericsson* above described, use the same air over and over. They, however, compress the air to a higher degree. The operation of obtaining the power is theoretically the same in both engines.

Accompanying these engines are several varieties of pumps, each adapted for a particular service, such as deep well pumping, forcing water to extreme heights, etc. The pump usually furnished is intended for what is called "surface pumping," and is secured to the cold side of the engine; it is double acting. The main portion consists of two parts of cast iron. The working barrel is a brass cylinder, and the piston is packed with two cup leathers made of sole leather pressed into shape. The four valves, two for suction and two for discharge, consist of cylindrical pieces of rubber, and, being free to roll with the action of the current of water, the wear is even throughout the entire length. The valve seats are milled smooth to fit the valves. The ports covered by the valves are not, as usual, a series of small openings, but consist of a single port without bridges or grating, thus preventing the inconvenience arising from the seats becoming clogged with grass, etc. The suction valves are situated at the bottom part of the pump, as near the base of the engine as possible. The discharge valves are placed in the upper portion. In designing this pump, great care was exercised in order to prevent the possibility of any "air trap." The pump rod works through an ordinary stuffing box, which is packed in the usual manner, and provided with a neat cup to catch any leakage; tapped in the cup is a pipe for leading away the water which collects in it; this makes it easy to keep the engine and surroundings dry and clean.

In addition to the above mentioned hot air pumping engines, Messrs. C. H. De Lamater & Co. manufacture an extensive line of steam pumping machinery, both single and duplex. Figure 1 represents one of their duplex steam pumps, which has many novel points about it, and in which the workmanship and material appear to be of the highest standard. These duplex steam pumps are used for pumping water for hydraulic elevators in large office buildings and hotels, where it is imperative to prevent all noise, as the steady flow of water through the pipes is perfectly noiseless and without the slightest jar.

They also manufacture and have on exhibition a very handsome single steam pump, which for smooth working and general design and appearance is quite attractive. These pumps have been made on an extensive scale, and some very large ones have been built. The new steel cruisers recently built by the U. S. Government are fitted with these pumps.

The De Lamater Iron Works have been long and well known throughout the United States, and are at present one of the largest establishments of their kind. The pumping engine department is only one of many in their business, and they make a specialty of surface condensers for all purposes, and manufacture general machinery of all kinds. The "De Lamater" propeller wheel is well known to all steamboat men throughout the country. The works are situated at the foot of West 13th Street, and their general offices are at 16 Cortlandt Street, New York. They also have a branch house at 40 Dearborn Street, Chicago.

IT has been asserted that the quality of tea may be approximately estimated by the weight of ash which it yields, the value of tea being inversely proportional to the ash. M. Nikatinski has lately, says the *Grocer*, made a series of experiments with the view of testing the truth of this assertion, and finds that the ash is a very fair index of the quality of the tea. Thus a good Shanghai tea gave 5·16 per cent ash, a cheap green brick tea 6·87, and two Orenburg teas, which are known to be adulterated with rose leaves, and of which the price was 115s. and 48s. per cwt., yielded respectively 7·87 and 10·42 per cent of ash.

Velocity of Projectiles.

The manner of ascertaining the velocity of a projectile was lately described and illustrated at the meeting of the New York Electrical Society by Henry A. Sinclair, electrician at the United States Ordnance Proving Ground at Sandy Hook. One of the Boulenge chronographs used at the proving ground was set up in the lecture room, and Mr. Sinclair demonstrated its quickness and accuracy in determining the velocity of a pistol ball. The instrument was described as being very simple and very easy to work. It consists of an upright brass tube, supporting two electro-magnets, one above the other. When a test is being made, an electric wire connects one of the magnets with the point of firing, and another electric wire connects the other magnet with the target or objective point of the projectile. A long rod is suspended from the first magnet, and a short rod hangs from the second one.

The projectile in leaving the gun cuts the first wire, and the broken circuit releases the long rod, which drops downward. When the projectile strikes the objective point, the second wire is broken and the short rod falls, striking a spring which causes a knife blade to mark the descending long rod. The space from the base of the long rod to the indentation is then measured, and by the fixed law of falling bodies the time taken by the projectile in going from the gun to the target is ascertained, and from that the velocity is figured. Mr. Sinclair took a good sized revolver, loaded it with 3½ grains of powder and a bullet weighing 133 grains, and fastened one end of the wire attached to the first electro-magnet across the muzzle. He then fired at a wired target in a tubular shooting gallery about 4 feet long. The time of the transit of the bullet was determined from the mark on the long rod, and it was speedily announced that the velocity of the bullet was 156 feet per second. A second trial with the same instrument showed a velocity of 207 feet per second.

"Why is it desirable to ascertain the velocity of a projectile?" asked a member of the society.

"Because," replied Mr. Sinclair, "it is a means of comparing the power of a gun, of comparing different kinds of powders and projectiles, of determining their energy, and approximately their range and penetration into iron plates. Had the officer in command of the Monitor at the time of her memorable encounter with the Merrimac known what his guns would stand, he could have sent projectiles clear through the iron-covered sides of the ram. He used only six or seven pounds of powder in a charge when his guns would have stood charges of fourteen or fifteen pounds. Few persons realize how much energy a large projectile possesses. A 12 inch shot weighing about 700 pounds, and traveling with a velocity of 1,500 feet a second, would strike as hard a blow as a railroad train consisting of locomotive and five or six cars (weighing about 100 tons) moving at the rate of 57 miles an hour.

Attempts were made to ascertain the velocity of projectiles as early as 1740, and in 1840 electricity was first used for that purpose. By the Schultz chronoscope, which Mr. Sinclair said was the most accurate instrument of its kind, intervals of time can be measured from thirty seconds to one five-thousandth part of a second. Mr. Sinclair exhibited specimens of the fuses used to fire large guns, and also showed several varieties of powder. Some of the grains were as large as a hen's egg. The method by which the pressure exerted by an exploded charge on the inside of the gun was measured was explained. The lecturer said that guns had been tested at Sandy Hook up to a pressure of 107,000 pounds per square inch, but that was extraordinary. The average pressure on a gun was about 40,000 pounds to the square inch. The velocity of projectiles from large guns ranged from 600 to 2,400 feet per second.—*New York Times.*

American Competition.

The London *Globe* says:

"A reduced American tariff means closer competition against this country in the neutral markets of the world. Every diminution of that tariff will give new impetus to American productions, and will be equivalent to additional tightening of the screw of international competition. Unfortunately for this country, there are other elements in the industrial condition of the States which will act to our detriment. One of these is the silver question, the other is the superior mechanical equipment of American industry and the more satisfactory relations prevalent between capital and labor in that country.

"But our great fear as to the industrial future of this country, in its inevitable rivalry with the United States, lies in the more perfect organization of our competitor. The American is *par excellence* a mechanical inventor. His natural ingenuity, fighting against the artificial enhancement of prices resulting from the prevalent fiscal system, has driven him to seek relief in mechanical assistance. He had compensated for dearness of material in cheapness of production. Every workman in every manufacturing center is stimulated to study and master the machine under his charge, with a view to improving it. Mechanical development is part of the character of the nation. We may be sure that the country which produced the grain elevator, the oil pipe pumps, machine-made watches, the high speed printing machines, the ring frame, and other inventions without end, will develop still greater creative powers under the stimulus of a growing export trade. Where shall we be then? The relations also between the capitalist and labor classes in the States are more of a nature to encourage production and to develop the capacities of rising generations. Greater attention is given to the physical and moral well-being of the American artisan than is considered to come within the sphere of duty of the British or European manufacturer. A certain spirit of emulation pervades the laboring classes on the other side of the Atlantic, in the place of the leveling down to a general average which prevails in this country. The American artisan works for himself, knowing that his success will be recognized and encouraged. He seeks to rise, and his industry progresses with him. Are we doing all we should and all we might do on this side to keep pace with this progressive movement? We fear not, and yet such social advance leaves an indelible mark on its generation, and expresses itself industrially in good merchandise and low prices."

Zinc in Drinking Water.

A paper on the above subject is given in the *Journal of the American Chemical Society*, by Dr. F. P. Venable. It has long been known that zinc dissolves in water, and that soft water, such as rain water, dissolves it more easily than hard water. Water containing carbonic acid is specially able to dissolve it. The use of galvanized iron for pipes and tanks being so much on the increase, the subject becomes more and more important, and it is desirable to ascertain, as far as possible, to what extent solution of the zinc coating takes place, and how far water contaminated by zinc is injurious to health. The author quotes several investigators as to the latter point, the evidence being to some extent conflicting, but giving a very decided balance on the side of the view that such water is considerably injurious. Investigations made on behalf of the French Government resulted in the prohibition by the Ministry of Marine of the use of galvanized iron tanks on board men-of-war. Professor Heaton has given an analysis of a spring water, with a further analysis of the same water after it had traveled through half a mile of galvanized iron pipe. It had taken up 6·41 grains of zinc carbonate per gallon. Dr. Venable gives the results of an observation of his own, where spring water passed through 200 yards of galvanized iron pipes to a house, and took up 4·29 grains of zinc carbonate per gallon. It seems pretty clear that drinking water should not be allowed to come in contact with zinc.

Chiccory with Coffee.

The chiccory root, which was used more with coffee when the latter brought a higher price than it does now, but which is still greatly used on the Continent, somewhat resembles a parsnip. The stem rises to a height of two to three feet, the leaves round the base being toothed, not unlike those of the dandelion—indeed, it is closely allied to that plant. The preparation of chiccory, as carried out in Belgium, is very simple. The older white roots are selected, cleaned, sliced, and kiln-dried, and are then ready for the manufacturer. It is roasted in an iron cylinder, called a drum, which revolves over a coke furnace. When taken out it is of a dark brown color, and while hot it is soft and pliable, but after being raked out and subjected to a draught of cold air, it becomes hard and crisp, and is then ready for the mill. From the mill the powder is passed through a cylinder sieve, from which it emerges as fine as the finest flour; and the partially ground pieces, or foreign matters that may have found their way into the chiccory, drop into a separate bin. The shades of color vary occasionally to suit the taste of the purchaser. The chiccory root is cultivated in Belgium, Holland, France, and Germany. In Belgium, where it is also used as a vegetable, it is very extensively grown, its culture and its manufacture (both of which are unrestricted) forming two of the greatest industries of that country; and its infusion is largely drunk as an independent beverage. For home consumption it is put up in small round and square packets of various weights, with highly colored and attractive looking labels attached, and so dispensed to the public, who can also purchase it in a loose state. To preserve it in good condition, chiccory should be kept in a tightly closed tin box and in a dry place; otherwise, it will become lumpy and rank, and unfit for use. Instead of being ground down to a fine powder, chiccory is sometimes granulated—that is to say, ground into grains or small lumps. This is often done when it is intended for export, as in this state it can be packed loosely in barrels, and is less likely to deteriorate. When exported in powder it is packed in tin cases, which are hermetically soldered down to prevent injury from atmospheric changes. The London *Grocer* says that large quantities prepared in both ways are annually shipped from Belgium to all parts of the world.

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THE GREAT DRILLING MACHINES OF THE FORTH BRIDGE.

In the SCIENTIFIC AMERICAN of April 4, we gave a description of the main piers of this great bridge, with the construction and method of erection, and also described and illustrated the caissons used in building the piers. From the accompanying elevation and plan views of the bridge, the general dimensions and form can be ascertained; Fig. 5 shows a cross section of one of the mammoth tubes, and Figs. 2, 3, and 4 show the machines for drilling these tubes.

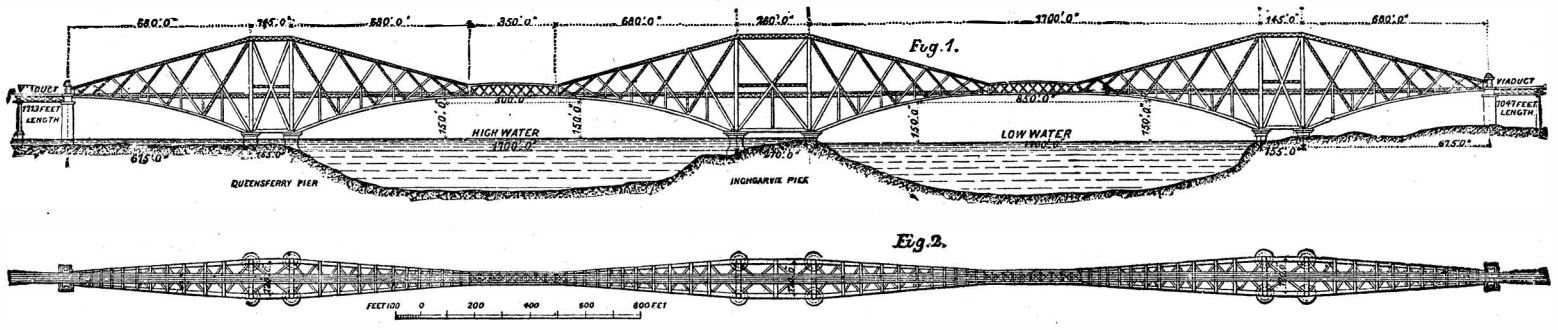

Fig. 1.—THE FORTH BRIDGE.—ELEVATION AND PLAN.

One of the well known features in the design of this undertaking demands that struts of hitherto unequaled length and capabilities for resisting thrust be employed. The form which best fulfills these conditions is the tubular. As well nigh six miles of tubes are required in the completed bridge, it at once becomes evident that the construction of them could only be effected within a reasonable time by the adoption of special plant. Owing also to their novelty of form and great size, no machinery was in existence capable of dealing with such work. On account of this, and for various other reasons, it was determined to design special plant for the whole work.

The struts required are of various dimensions, ranging from that of the largest, 12 feet in diameter, to that of the smallest, which is only 3 feet. Fig. 5 is a cross section of one of the 12 foot horizontal tubes between the piers. It consists of ten plates and ten longitudinal H beams, stiffened at intervals of 8 feet by means of the circular girders shown in elevation. The girders, again, are made up of diaphragm plates, connected to inner and outer angles, the former being riveted to the H beams, while the latter are similarly fixed to the tube plates.

One of the most difficult operations was the curving of the heavy plates, which are 16 feet by 4 feet 4 inches by 1⅛ inch and 1¼ inch thick, and weigh from 28 to 32 hundredweight each. The method now adopted is to bend them while hot in a large hydraulic press, from which they are removed, and allowed to cool slowly. When cold, they are again placed in the press and straightened finally. The edges and ends are then planed, and each plate is weighed, marked, and laid aside, ready to be placed on the tube when required. The longitudinal H beams are made up of a deep webbed tee and two angles, being partly drilled through these before erection. The circular girders are also partly drilled before being placed on the mandrel. These different parts form the main tube proper, leaving out the connections to skewbacks, the girder fixtures, tees, and other minor details, with which it is not at present intended to deal. The tubes are built round about a mandrel, being supported therefrom by temporary connections, and drilled through the various parts, while in the exact form they are intended to be when finally erected.

The mandrel, plate edge planer, hydraulic press, and hydraulic crane are very fully described and illustrated in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 478.

The work of building and drilling the tubes is done out in the open (Fig. 4), on what is called the drill roads. These are laid down to suit the drilling machines, and at such a distance and with such a length as to allow the bracing girders and connections thereto to be placed in position, as the work stands on the ground, prior to the final erection. The roads are so arranged as to be all equally suitable of access for the steam traveling cranes used in carrying the material to position and in building the tubes. This is accomplished by means of traversers, of which there are three, one in the center and one at each end of the drill roads, those at the ends running on rails at right angles and close to the main roads, but fully 12 inches lower, while the center one is run on cross rails, on the same level as the main roads. If it is necessary to change the position of a crane, it is run on to the traverser, and on it carried to the desired point, and there run off. In this way the whole of the ground is commanded by the cranes.

The mandrel, M (Fig. 5), is 45 feet long by 5 feet in diameter, raised on iron trestles, T, to a height, at the center, of 10 feet from the ground. This corresponds with the center of the outer rings of the drilling machines. The great length of mandrel is required to allow of its being carried up at the ends, where the H beams and plates are built in position. On this mandrel there are now secured, but in halves, temporary iron rings, R, at the horizontal distance from each

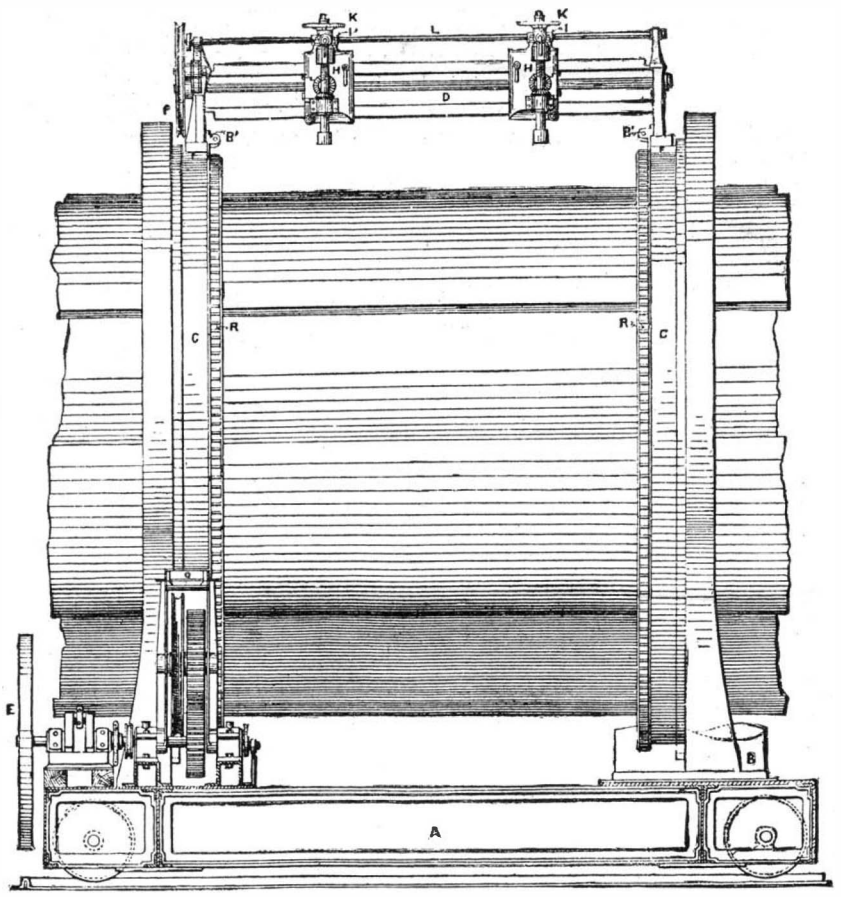

Fig. 3.—SIDE ELEVATION OF TUBE DRILLING MACHINE.

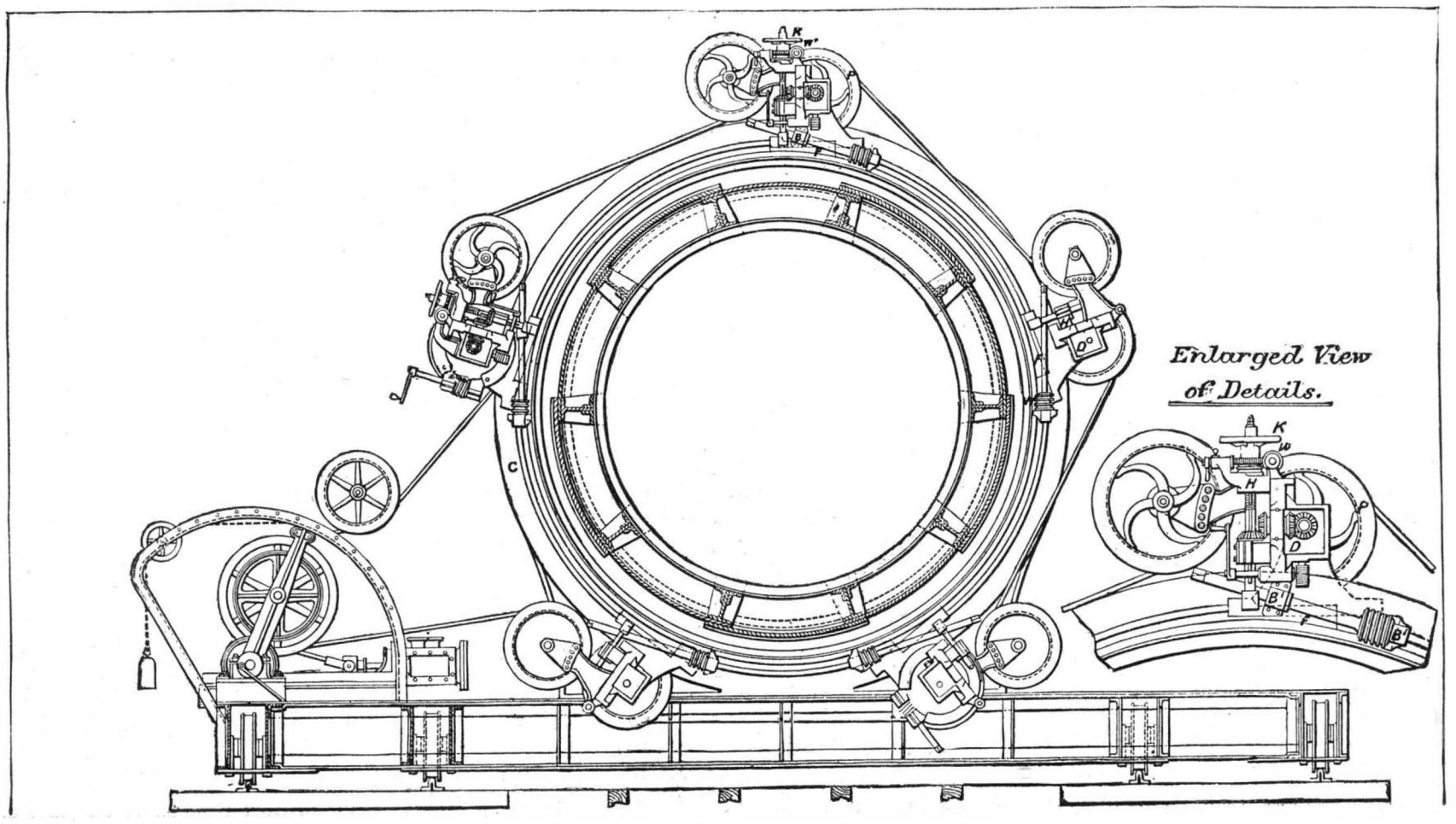

Fig. 2.—SECTION OF TUBE DRILLING MACHINE.

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other of 8 feet. To these are fixed the radiating plates, P, having holes punched in the outer end for bolting on the first part of the permanent work, viz., the inner angle, A, of the circular stiffening girders. The same bolts are also made to carry the web plates, W, of these girders, on the outer edge of which are fixed the angle irons, I, for making the final connection to the shell of the tube. The horizontal H beams, H, are now placed in position, being securely bolted through the inner angle of the circular girders. On these beams are now placed the shell or tube plates, the ends forming butt joints, while longitudinally they lap one another, this taking place over the solid flange of the H beams. The end joint of the one plate breaks opposite the center, or solid part, of those on either side. The first plates to place in position are the inner, or those lying close against the flange of the beams, beginning generally at the bottom and coming up on each side. Owing to the passing of the one plate beyond the other, one-half of each remains free to put grabs and drawwashers on, without interfering with the placing of the outer ones in position. So soon as the outer ones have been put on and fixed in a similar manner, there are passed round all a couple of angle iron rings, for binding and drawing them up to their proper position. The tightening them up is done by means of iron wedges between the plates and the rings. After the bottom plates have been fixed in position, the tube is borne up by wooden blocks, built between it and the cradle underneath. The true position of the tubes, both as regards horizontal distance apart and height, is found by means of a theodolite, placed at one end of the roads, on a fixed platform, in a position such that when it is in line with a stationary point at the other end it always fixes the centers 120 feet apart throughout, and horizontally in the same plane. If the center of the mandrel is not in this line, then it is made so by being raised, lowered, or shifted sideways to suit. When the mandrel is right, the tube must of necessity be so also, seeing the centers coincide.

When the building of one ring of plates has been completed, the drilling machine is moved forward, the blocks in front being taken out of the way and rebuilt behind as it is traveled along. To enable the drilling to go on continuously, the building of the tube in front is being proceeded with while the machine is still at work on the portion immediately behind. These tube drilling machines—of which there four—are shown in Figs. 2, 3, and 4. Each is self-contained, and on being run along the rails, carries all with it. The principal parts are the wrought iron underframe or carriage, A, on the one side of which is fixed the engine, E, and boiler, B, and two large cast iron rings, C, firmly bolted to the main cross girders. These rings have an internal diameter of 13 feet, sufficient to enable them to pass freely round the tube when the machine is being moved along. Five cast iron slides, D, are fixed thereon, and held in position by means of small slipper blocks, F, fitting into a recess in each of the rings, C. On each of the slides are the two heads, H H. Each head is provided with a single drill, and is capable of being rapidly run from one point of the slide to another by rack and pinion gearing. The slides are kept in position, and also turned round the rings, C, in either direction, by means of two worms, W, carried in brackets, F, one gearing in each ring in the circular racks, R. These racks being bolted to the rings serve also as guides for steadying the whole upper portion of the machine. All the drills point to the center of the tube, and having, as shown, both a circular and longitudinal motion, can with ease be made to reach every hole in any part of the structure; some of which are through a depth of as much as 4 inches of solid metal.

It might be here mentioned that some of the slides were specially designed to overcome the difficulty of drilling, say, a flat part in any of the tubes. The difficulty lies in the fact that the drills on any of the fixed heads always point to the center of the tube, whereas in the case just mentioned the holes require to be drilled at right angles to the special or flat part. The mode adopted to overcome this was to make both ends of each slide circled, fitting them into separate heads, which in turn were bolted to the slipper blocks, F, as in the others. On the head at one end is placed a worm, while on the same end of the slide there is keyed a wheel into which the worm is geared, by turning which the slide can be made to place and keep the drill pointing in any required direction.

The whole of the drills are fed into their work by an automatic arrangement, the motion being imparted to the longitudinal shaft, L, by a band driven off the main driving pulley. On this shaft slides, and by it also are driven, the worms, W¹, necessary for turning the worm wheel, I, which at will can be made to drive the hand wheel, K, thereby feeding the drill into its work. At one end of each of the main slides is overhung the driving pulley, P, the power being transmitted from the engine to the whole of these by means of a cotton rope, guided where necessary by supplementary pulleys. The slack is taken up by a shifting quadrant, moving about the engine shaft as a center, assisted by auxiliary pulleys on a wrought iron frame close by the engine.

When starting work on any tube, a drilling machine is moved forward to the point at which operations are to begin. Each of the five slides is now moved around the rings until all the points of the drills face truly any series of holes in the longitudinal beams. The holes in this line, or series, are all drilled, two drills being at work on each line, then the slides are again placed so as to suit a new set, and so on until the whole of the tube commanded by the machine in its present position is finished. This is equal in length to 8 feet, and includes the full circumference of the tube. The number of holes in such is about 800, and the time required to drill all, when working continuously, is from twenty-four to twenty-eight hours, varying thus much principally on account of the difference in thickness of the various parts of the tubes. For Figs. 1 and 4 we are indebted to *La Nature;* for Figs. 2, 3, and 5 to *Engineer.*

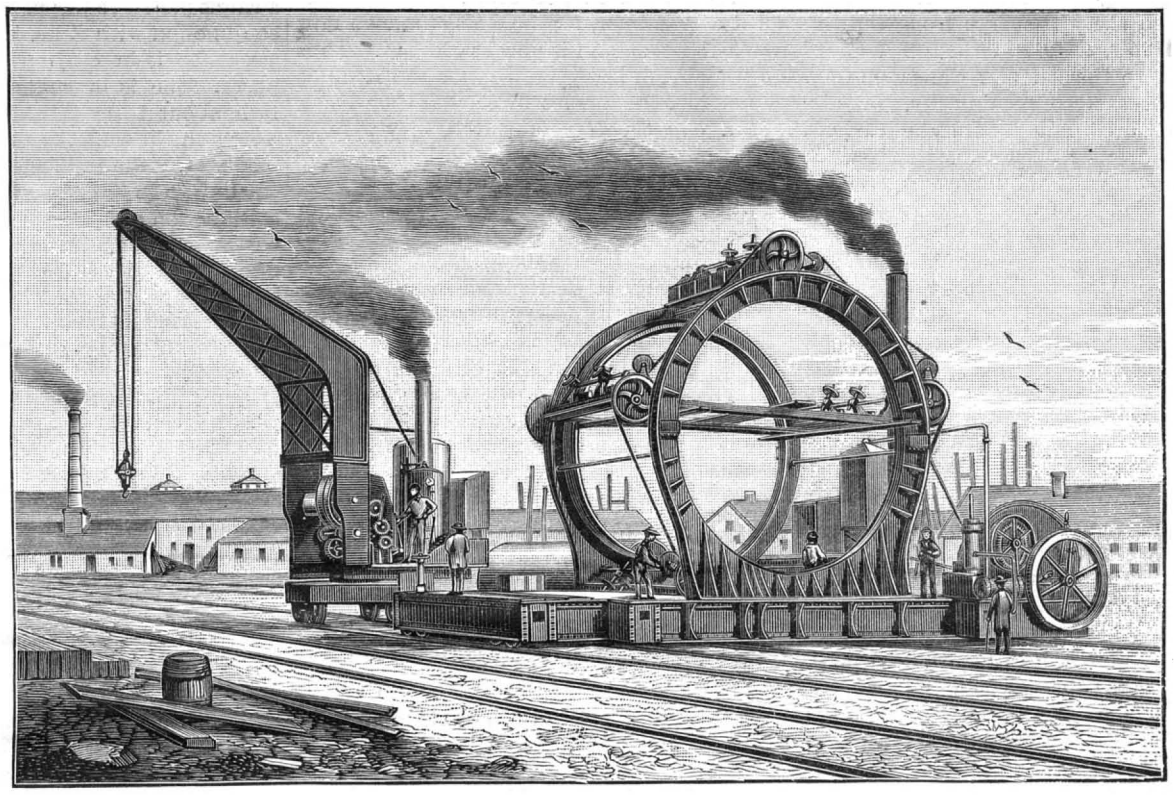

Fig. 4.—THE GREAT DRILLING MACHINES OF THE FORTH BRIDGE.

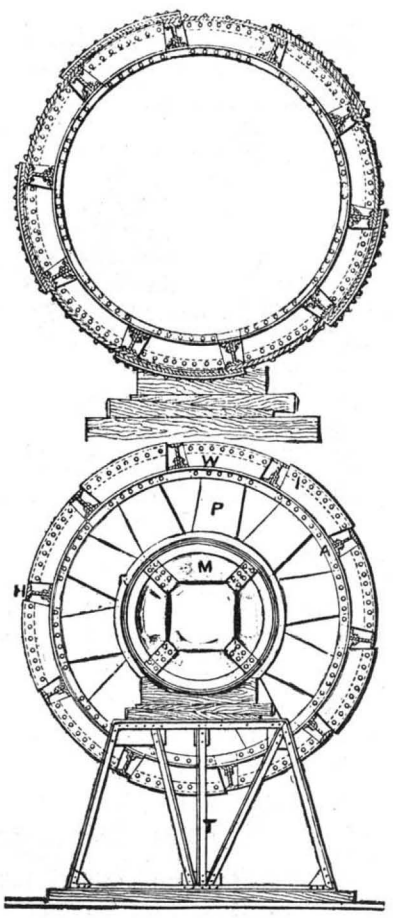

Fig. 5.—SECTION OF TUBE AND MANDREL.

Spontaneous Combustion.

The Boston Manufacturers' Mutual Fire Insurance Co. in a recent circular says:

A very considerable loss has lately been incurred by one of our members in a building used for dyeing and drying, which was not suitable to be insured by us, and on which we had refused to issue policies. This fire has been made the subject of close investigation, and is very suggestive.

The building consisted of two sections, divided by a brick party wall, in which there were wide doorways fitted with suitable fire doors. On one side the risk was considered *bad*, and this part had been fully protected with Grinnell automatic sprinklers. On the other side the risk was considered *fair*, and automatic sprinklers had not been placed therein, but were about to be.

In this "fair" section the fire occurred, and the section, with its contents, was wholly destroyed. The "bad" section was wholly saved by the automatic sprinklers, the workmen having been driven from the building without being given time to close the fire doors, so that the fire might have passed except for the sprinklers.

The circumstances were as follows: Stock known as camel's hair, dyed with chromate of iron, was in process of drying, under the action of a 56 inch fan operating at nine hundred revolutions per minute.

The fire is attributed to the spontaneous combustion caused by the rapid oxidation of the chromate of iron. In a still air it might have smouldered, but, under the influence of the fan, it burst into flame with the semblance of an explosion; the men were instantly driven from their places, and the section was totally destroyed, while the other division was saved as already stated.

The point of interest therefore is, how to stop a fan automatically, the instant a fire occurs, by the action of the heat; and this problem may be considered not only in connection with drying machinery, but in connection with all fans, and, perhaps, with some or all blowers.

This can be accomplished by automatically throwing off the belt, and it is probable that a different device may be required for each kind of fan; but in every device a fusible link can be made use of, soldered with the same solder which is used in automatic sprinklers, or with solder melting at a high degree, if exposed to more than ordinary heat.

The constant recurrence of fires caused by friction and spontaneous combustion in the processes of drying fabrics, as well as fibers, keeps us in the constant expectation of loss in the processes of drying, and we therefore again revert to the subject.

Hollow versus Solid Shafting.

A shaft made in the shape of a tube is stronger than it would be if made of a solid bar of the same dimensions. From this, however, it does not follow that a solid shaft is increased in strength or better prepared to stand a sudden twist if a portion of the material is bored out along its central line. Frequently workmen entertain the idea that the core of an axle or the bearing of a shaft is a hinderance in the way of strength, and is one of the reasons for making them hollow; this not so, as it is merely the arrangement of the material that improves its strength. Boring out a solid shaft lessens both its weight and its strength, but the material is removed from the portion where the least resistance is offered; therefore the loss of weight is greater than the loss of strength. The particles on the outer surface are tested to their utmost when those in the center barely receive any action at all, and from this line to the circumference they are gradually being brought into use until those on the outside are ready to break apart when the limit of strength is reached. In tests that have been made, results have shown that the weight may be reduced sixteen per cent by boring, while the strength would not be lessened by more than one and a half or two per cent. The success of many designs lies in so arranging the material that where any fracture is likely to occur, as much metal may be used as is likely to be wanted to stand the increased strain.—*The Garden.*

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ASPECTS OF THE PLANETS FOR MAY.

VENUS

is morning star until the 4th, and then commences her brilliant career as evening star. On the 4th, exactly at midday, an event occurs in her history that gives her prominence on the annals of the month. She is in superior conjunction with the sun, passing beyond the sun, making her advent on his eastern side, clinging closely to him for a time, and hiding herself in his brilliant rays. As the weeks roll on she will emerge from her seclusion, shine with fitful glow, almost in the full blaze of the twilight, and before the summer wanes will be the loveliest object in the western evening sky, while winter will commence in earnest before she reaches her point of greatest distance from the sun. No true lover of the stars can gaze unmoved upon this fascinating planet, as, like a golden bead strung on an invisible wire, she oscillates eastward from the sun until her eastern elongation is reached on the 8th of December. Even more interesting is her return to the great orb, to whom she is linked by chains lighter than gossamer, and indestructible as the material universe itself.

Observers who watch closely the movements of this radiant star will readily perceive the oscillation eastward and westward from the sun, for such is the appearance she presents to spectators on the earth.

In reality, Venus and the earth are both revolving in elliptical orbits around the sun, as would be plain if observers could take the great luminary for a standpoint. Venus, being nearer the sun than the earth, moves faster and in a smaller orbit. She travels 21 miles in a second, and it takes her 225 days to complete a revolution. The earth moves slower, and makes a larger circuit. She travels 18 miles in a second, and completes a revolution in 365 days.

Thus our nearest planetary neighbor and her twin sister, the earth, move on in their shining paths, the former gaining upon the latter all the while. A time must come when the two planets and the sun will be in line, as is the case with all the planets in the system, and on the 4th Venus and the earth will reach that point.

Mathematicians give the exact figures. When Venus has made two entire revolutions and six-tenths of a third one, and the earth has made one revolution and six-tenths of a second one, a superior conjunction of Venus will take place, following, of course, a preceding epoch of the same kind. Venus requires 584 days to accomplish this feat. It is therefore called her synodic revolution, and represents the time that elapses between two consecutive returns to superior conjunction. The same law holds in regard to inferior conjunctions.

Venus, then, on the 4th, is in superior conjunction with the sun, rising and setting with the sun. She is in line with the sun and the earth, the sun being in the middle, is at her greatest distance from the earth, invisible as she passes beyond the sun, and invisible for some weeks to come, being eclipsed by his all-powerful light.

Although at present we may not behold the fairest of the stars with the physical eye, it is none the less sure that the light of her countenance is turned earthward, and that before long she will be visible in the west as evening star, and will throw a spell over the summer nights with her soft, dreamy beauty. She is lovely as in the morning sky she heralds the sun's approach in the glowing east, and even dares to shine in his majestic presence. She is more lovely, in our view, as, in the evening sky, she hangs in the star depths like a golden lamp suspended on invisible chains, sinks slowly in the west, increasing in brilliancy as the shadows deepen, outshining the myriad twinkling hosts that surround her path, and reigning the acknowledged queen of the star-spangled firmament.

But we anticipate the coming glory of our sister-planet. For, during the month, she can only be seen by the eye of fancy as she makes her way toward us amid the blaze of sunlight that encircles her.

Venus, on the 11th, moving eastward from the sun, pays her respects to Neptune, moving westward toward the sun. The planets are in conjunction, Venus being 1° 15′ north.

The right ascension of Venus on the 1st is 2 h. 39 m.; her declination is 14° 38′ north; her diameter is 10·2″; and she is in the constellation Aries.

Venus rises on the 1st 8 minutes before 5 o'clock in the morning; on the 31st she sets 20 minutes before 8 o'clock in the evening.

JUPITER

is evening star throughout the month. His course is marked by an interesting event. On the 17th, at 10 o'clock in the morning, he is in quadrature with the sun on the eastern side. Jupiter in quadrature is almost as impressive as Jupiter in opposition. For as the sun sinks below the western horizon, the princely planet comes into view, looking down with friendly eyes from the zenith. It is a fitting place for the most distinguished member of the sun's family, who, though three months have passed since opposition, retains the golden luster, the large proportions, and the beaming aspect that marked his presence on his nearest approach to the earth.

Jupiter and Regulus continue to be near neighbors during the month, as they have been for the last six months. On the 30th, at 7 o'clock in the morning, they are in conjunction for the third time, Jupiter being 41′ north. A better opportunity seldom occurs for studying the difference in apparent movement between a planet and a fixed star. The star seems to be unchangeable in its position, being carried westward by the earth's motion eastward in her orbit. The planet is rightly named a wanderer, for he seems to move now forward, now backward, and is now stationary. Thus on the 7th of October of last year, Jupiter and Regulus were in conjunction, the planet after that time being east of the star. On the 14th of March, they were in conjunction again, changing places, the planet being west of the star. On the 30th they will be in conjunction for the third time; the planet again being east of the star, to whose vicinity he will no more return until he has completed a revolution round the sun, taking in the whole circle of the zodiac. Regulus is very near the sun's path, being only half a degree from the ecliptic, so that sun, moon, and planets are often passing near it. Mars was in conjunction with the star in May, and Venus in October of last year.

The right ascension of Jupiter on the 1st is 9 h. 54 m.; his declination is 13° 58′ north; his diameter is 37·2″; and he is in the constellation Virgo.

Jupiter sets on the 1st about a quarter before 1 o'clock in the morning; on the 31st he sets a few minutes before midnight.

NEPTUNE

is evening star until the 13th, and then becomes morning star. On the 13th at noonday, he is in conjunction with the sun, passing to the sun's western side, and commencing his course as morning star. He is the first of the giant planets to reach the goal, though the other members of the fraternity will follow his example in due time.

It is well to note the difference between the conjunction of an outer planet and the superior conjunction of an inner planet, as illustrations of both occur during the month. In the former case, that of Neptune, he passes from the sun's eastern side to his western. In the latter case, that of Venus, she passes from the sun's western side to his eastern, apparently reversing the process. Venus, being the first to arrive at conjunction, must meet Neptune hastening to the same goal, and, as already referred to, the planets are in conjunction on the 11th.

The right ascension of Neptune on the 1st is 3 h. 22 m.; his declination is 16° 47′ north; his diameter is 2·5″; and he may be found in the constellation Taurus.

Neptune sets on the 1st at half past 7 o'clock in the evening; on the 31st he rises about half past 3 o'clock in the morning.

MERCURY

is morning star. On the 25th he reaches his greatest western elongation, being 24° 59′ west of the sun. Although he is nearly as far as possible from the sun, he is 9° south of him and not as favorably situated for observation as he was at eastern elongation in April, when he was 19° 26′ from the sun. He will, however, be visible to the naked eye, under the best conditions of wind and weather, for it is the first of the three times in the year when there is a possibility of picking him up as morning star. On the 25th he rises about an hour before the sun, and is in the constellation Aries, but there are no bright stars in the vicinity to point him out. The observer who succeeds in finding him is blessed with keen visual power.

On the 13th, at 3 o'clock in the morning, Mercury is in conjunction with Mars, being 2° 27′ south. On the 30th, at 4 o'clock in the afternoon, he is again in conjunction with Mars, being 2° 56′ south.

The right ascension of Mercury on the 1st is 2 h. 12 m.; his declination is 12° 49′ north; his diameter is 12″; and he is in the constellation Aries.

Mercury rises on the 1st about half past 4 o'clock in the morning; on the 31st he rises at a quarter after 3 o'clock.

MARS

is morning star. He is twice in conjunction with Mercury, and very near him during the whole month.

The right ascension of Mars on the 1st is 1 h. 32 m.; his declination is 8° 54′ north; his diameter is 4·4″; and he is in the constellation Pisces.

Mars rises on the 1st soon after 4 o'clock in the morning; on the 31st he rises about 3 o'clock.

SATURN

is evening star. He is now conspicuous in the western sky, but at the close of the month will be too near the sun to be of much account.

The right ascension of Saturn on the 1st is 5 h. 24 m.; his declination is 22° 10′ north; his diameter is 16″; and he is in the constellation Taurus.

Saturn sets on the 1st a few minutes before 10 o'clock in the evening; on the 31st he sets about a quarter after 8 o'clock.

URANUS

is evening star. The month closes with Neptune, Mercury, and Mars as morning stars, and with Venus, Saturn, Jupiter, and Uranus as evening stars.

The right ascension of Uranus on the 1st is 11 h. 58 m.; his declination is 0° 58′ north; his diameter is 3·6″; and he is in the constellation Virgo.

Uranus sets on the 1st soon after 3 o'clock in the morning; on the 31st he sets soon after 1 o'clock.

THE MOON.

The May moons fulls on the 28th at 31 minutes after 3 o'clock in the evening. The moon does not encounter a single planet in her path until the 12th, when she is in conjunction with Mars, being 2° 3′ south; four minutes later she is in conjunction with Mercury, being 22′ north. She is in conjunction with Neptune on the 14th, about three hours before new moon, and with Venus on the same day about three hours after new moon. On the 16th, she pays her respects to Saturn, on the 20th to Jupiter, and on the 23d she makes a close conjunction with Uranus, being 1° 11′ south. The close conjunction with Mercury on the 12th is an occultation for observers more favorably situated, and so is the conjunction of Uranus on the 23d, an occultation to observers in some parts of the far south.

The celestial kaleidoscope reveals a brilliant picture for the month of May. Venus is in superior conjunction, Neptune is in conjunction, and Jupiter in quadrature with the sun. Mercury reaches his greatest western elongation. Venus is in conjunction with Neptune. Mercury is twice in conjunction with Mars. The moon, besides swinging her ponderous sphere near the whole family of planets, occults Mercury and Uranus, for the telescopic delight of those observers who chance to be on that portion of the earth's surface where the exhibition is visible.

A Bark Canoe.

The camping out season is approaching, and an accessory to a life in the woods is the canoe. A writer in *Macmillan's Magazine* gives the following timely information for tourists: A bark canoe is only one man's load; he turns it upside down, and walks with it on his head. A man toiling across a portage in this attitude is a somewhat grotesque sight, suggesting a monstrous new kind of snail. Then the canoe will go over shallows where anything else would stick, and as for handiness, an expert canoeman will almost turn it around with one twist of the paddle. Repairs are frequent but simple, consisting mainly in the free application to damaged places of a resinous gum kept in store for that purpose. Speed is a secondary consideration; you cannot go fast paddling up, and you cannot help going fast coming down. We came down a reach in half an hour that we had taken half a day to work up. Often towing and poling have to be resorted to to make way against a heavy current. Paddling, though a more wasteful application of muscular work than rowing, is less fatiguing when the pace is not forced, and after a little practice becomes a very delectable exercise. The traveler embarked on a canoe voyage has to carry most things with him. Along the river there are only scattered farm houses, and the only certain and comfortable way of securing shelter for the night is to camp out. The tents and other necessaries form the cargo of the canoes. It is astonishing how much stuff can be stowed away in a canoe that looks quite small—another merit of the savage birch bark vessel as compared with European boats. Every night we choose our camping ground, pitch our tents, and make our camp fire; this last is of great importance, not only for warmth and brightness, but for driving away insects, the only drawback in a life otherwise perfect. When people play at camping out in England, they make a fire a foot or two across, over which they hang a kettle on three sticks. In Canada you make a fire of logs five or six feet long, or may be whole roots of pine or cedar, which will burn all night. The trouble of chopping the wood up small would be greater than that of burning it as it is, and its cost is nothing. In many places, indeed, the best fuel is drift wood, which could in no way be made otherwise useful. Even in summer nights the fire is a welcome companion, and after a day's work at paddling, hot tea is the best of drinks whatever the temperature may be—not that other drink would be easy to get if one wanted it, but no such want is felt.

Diphtheria in the Chief Cities.

Deaths from diphtheria per 100,000 inhabitants in

Amsterdam	265	Paris	85
Berlin	245	Hamburg	76
Madrid	225	Naples	74
Dresden	184	Lisbon	74
Warsaw	167	Stuttgart	61
Philadelphia	163	Rome	56
Chicago	146	Edinburgh	50
Turin	127	Buda-Pesth	50
St. Petersburg	121	The Hague	45
Bucharest	118	Vienna	44
Berne	115	London	44
Munich	111	Christiania	43
Stockholm	107	Copenhagen	42
Malines	105	Suburbs of Brussels	36
Antwerp	104	City of Brussels	35
New York	91		

The *Siglo Medico*, from which this extract is taken, considers Brussels a highly favored city. It is certainly so in regard to exemption from diphtheria.

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ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Jefferson Fuller, of Huntington, W. Va. This invention covers a special construction and combination of parts of a device intended to couple cars automatically, having for its object to arrange the link pin to fall in place at the right time without the use of springs, and to manage the pin from either side or from the top of the car.

A car coupling has been patented by Mr. Isaac Linthicum, of Liberty, Neb. The drawhead has a funnel-shaped mouth, behind the bottom of which a recess or cavity is formed in the upper surface of the bottom, the front side of the cavity being beveled, and at the bottom of the cavity is a magnetic plate, to assist in keeping the outer end of the link raised, with other novel features.

A steam boiler has been patented by Mr. Thomas Kays, of Newton, N. J. This invention covers an improvement on the Lawson patented boiler of 1880, and provides for an additional partition or diaphragm dividing the steam space of the boiler arranged above or beyond the partition which divides the main steam space from the water space, such additional partition having openings in it for the passage of steam of somewhat greater aggregate area than the openings in the first partition, but still less aggregate area than the opening through which the steam passes to the cylinder of the engine.

MECHANICAL INVENTIONS.

A shuttle box motion for looms has been patented by Mr. Louis C. Werner, of Broad Brook, Conn. This invention covers a special construction and combination of parts to provide an improved mechanism for automatically operating shuttle boxes, made in such a manner as to adapt it to be applied to old looms, and one which is simple in construction and reliable in operation.

AGRICULTURAL INVENTIONS.

A sulky plow has been patented by Mr. James E. Mohney, of Eight Mile, Mo. This invention includes a novel system of connections from the front furrow wheel of the plow to the rear furrow wheel, so the furrow wheels will be moved toward and from each other by a swinging of one wheel, also special connections of the wheels to the tongue, and other novel features.

A check row attachment for corn planters has been patented by Mr. John K. Voorhees, of Pella, Iowa. This invention relates to certain improvements in a former patented invention of the same inventor, and is intended to facilitate the hills being always dropped to form rows both ways of the field, and so no difficulty will be experienced in effecting the proper adjustment of the parts.

MISCELLANEOUS INVENTIONS.

A screw cutting die has been patented by Mr. Philip H. Class, of Greenfield, Mass. By this invention screw cutting dies are set eccentrically in the stock or holder in a manner to allow of their opening and closing, so that screws of different depths or sizes may be cut, and the adjustment being given a wide range.

A calculator has been patented by Mr. John L. Richardson, of Tuscola, Mich. This invention covers a little machine with marked and figured disks, pointer operated by a ratchet wheel with one hundred cogs, and other novel features, making a simple device for adding numbers, one which gives reliable results and can be easily operated.

A rotary force pump has been patented by Mr. John Serdinko, of New Braunfels, Texas. It is made with a tubular standard having one or more flexible tubes with interior half tubes and an interior cylinder mounted upon a crank shaft and having adjustable bars carrying rollers, whereby a liquid can be raised by the successive action of the rollers upon the flexible tubes.

A machine for punching lock plates has been patented by Messrs. Thomas Donahue and William W. Cone, of Terryville, Conn. Combined with a punch and with a die having an L-shaped slot is a sliding carriage with a tongue having an L-shaped cross-section, a hopper being located between the sliding carriage and the die, the plate going into the die forcing out the stamped plate.

An adjustable folding table and ironing board support has been patented by Mr. Henry P. Schenk, of Jeffersonville, Ind., deceased (Sophia R. Schenck, adminstratrix). It is formed with two legs, to each of which an L-shaped top plate section is hinged, so that these top plate sections can be swung upward and united to form together a square or rectangular top plate, with other novel features.

A washing machine has been patented by Mr. Henry D. King, of Nevada, Mo. Hollow projecting beating studs are attached in the form of inverted cups to the lower side of the dasher, for beating the clothes more effectually than solid studs forcing the clothes in and out of the hollow spaces of the studs, with other novel features and special combinations, to make an improved washing machine.

A clothes line fastener has been patented by Mr. Thomas McCoy, of Lawrence, Kansas. It is formed of a pivoted lever with a fork at its upper and a crosspiece at its lower end, combined with another pivoted lever having a cross piece at its upper end, the rope being clamped between the cross pieces after it has been passed over the fork on the upper end of the lever.

A syringe has been patented by Mr. Henry M. Howell, of New York city. It is designed more especially for use with plastic substances, as ointments, salves, etc., and consists of a shell to be filled with the plastic substance, and inserted into the syringe tube, the plunger of the syringe to be forced into the shell for expelling the substance, thus avoiding the inconvenience of filling the syringe tube.

A safety attachment for elevator cars has been patented by Mr. Philip Cohn, of Nuevo Laredo, Mexico. Latches are pivoted to the standards, with means for throwing them outward, the latches being locked in place so as not to catch on racks in the shaft, but so that when the hoisting cable breaks, the latches are thrown outward and catch on the racks, thus locking the car in place.

A machine for embossing and ornamenting boot or shoe soles has been patented by Mr. William D. Hall, of Beloit, Wis. Combined with a shaft carrying a toothed die or wheel is a vertically movable shaft adapted to turn on its longitudinal axis, a horn held adjustably on the shaft, and a check screw for limiting the upward movement of the shaft, for ornamenting the soles and producing an imitation stitch.

A collar button has been patented by Mr. George Krementz, of Newark, N. J. This invention relates to improvements on a collar button formerly patented by the same inventor; it has a hollow stem formed on a base, and the edges of the head are bent and curved down so as to form a rounded head, and to prevent the edges of the head from cutting into the skin in case the button is tilted and laid over against the flesh.

A mechanism for converting motion has been patented by Messrs. Daniel D., George L., and Charles W. Wiley, of Lanark, Ill. This invention covers a special mechanism intended for use with windmills to convert the reciprocating motion of the pump rod into rotary motion for operating churns, grindstones, etc., insuring a noiseless movement and intended to equalize the irregular speed and power of the windmill rod.

Improved bolt work for safes forms the subject of a patent issued to Mr. Thomas M. Brintnall, of Maryville, Mo. The invention consists in a lever so connected with the bolts and so intercepted by latches that it will first extend the bolts and afterward retract them, while impelled continually in one direction by a spring or its equivalent, with various other novel features. The same inventor has also obtained a further patent having for its object to extend the bolts of a safe door by the act of closing the door, to lock the same, and to unlock the door by time mechanism, so the door may be both locked and unlocked without any means of communication with its lock after the door is closed.

Special.

VIEWS OF THE HON. WM. PENN NIXON.

Mr. Nixon is widely known as the editor of the Chicago *Inter-Ocean*, one of the most outspoken and spirited dailies of the present age. Like many other busy editors, Mr. Nixon overworked himself, and about six years ago found that his health was gradually running down. His business associates and his family felt that he was in a perilous condition, and urged him to take rest—giving up for a while all editorial labor. His natural ambition and his long habits of diligent work were against this. Declining the suggestion of a vacation, he kept at his desk. At last, after fighting for some months with the condition of his system, which was gradually undermining his vitality, Mr. Nixon concluded to take a few weeks of rest. Of that rest and of what followed it we will let him tell, in his own words, as communicated to one of our correspondents, who recently visited him at his editorial rooms in Chicago.

Mr. Nixon, who now appears in the prime of life, and in the full vigor of bodily and mental vitality, said, substantially: "It was in February, 1878, that I took a severe cold. My system had become much worked down, and, driven with constant editorial duty, I had neglected it. After long consideration I concluded to take needed rest. I went to Florida and Cuba for a few weeks. On the way I had several hemorrhages from the lungs. I was quite sick, and returned in no better condition than before. My wife was much alarmed about me. The physician who attended me on my return gave me inhalations, tonics, alteratives, and pills; after taking which, for about two weeks, I was weaker. I kept at my work, which was exacting. By September my state had become critical. I lost flesh, and suffered from a severe soreness in the upper part of my right lung. My wife's sister, who was in Boston, wrote about a treatment which was novel to me—Compound Oxygen. A relative of hers who had been in such poor health that he had been compelled to spend several winters in Florida had been restored by this Compound Oxygen to such an extent that he was able to endure the climate of Boston in winter. The little book issued by Starkey & Palen on Compound Oxygen was sent me, and after reading it I concluded that even if their method of treating my ailments could do me no good, there was reason to suppose that it would do me no harm.

"I procured a 'Home Treatment' from the office of Messrs. Starkey & Palen, in Philadelphia, determining to give it a fair trial, and abide the result. For four or five months I took the inhalations at regular intervals, twice a day; continuing my work steadily. At first no marked effect was observed; in fact, not until three or four weeks. Then I began to feel that it was doing me good. I found that when I was exposed to the cold, and to chilling draughts, my power of resistance was far greater than it had been. There was no exhilaration, but there was a constant increase of strength. I still coughed considerably, and, in fact, did so for some months. The sore spot on my right lung gave me much annoyance. I rubbed my chest with various liniments, and I wore a chest protector. But gradually the soreness went away, as the lung gained strength. And the cough, which had so long clung to me, at last went off in an unexpected manner. One of the last coughing spells I had was almost as severe and extended as any I had ever experienced. It seemed to be the going out of the cough habit. There was probably some extraneous matter in the way, and this severe spell of coughing got rid of it.

"I gained flesh very slowly, but gradually came back to my original weight, and now weigh more than before my illness. I am more able to resist cold, and, though I now take cold occasionally, I am far less subject to it than I was of old. My digestion, which was, of course, disordered, is now all that I can desire, and I am able to do my customary work without inconvenience or serious fatigue. I have never given a testimonial to any patent medicine, and I would not; but I do not consider Starkey & Palen's Compound Oxygen a patent medicine. It is a vitalizer and a restorer, and to it I owe my life."

"Mr. Nixon, did you ever take any other 'Oxygen Treatment' than that of Messrs. Starkey & Palen?"

"No; I had no use for any other. This served the purpose perfectly, and did even more than I could have expected of it."

"Do you ever have occasion to return to the use of the Compound Oxygen Treatment since your restoration to health?"

"Only occasionally; for instance, if I have been exposed, and have taken cold. But I keep a 'Home Treatment' in my family, for we set a high value on its efficiency in cases of need, and several of my friends have found the advantage of it. You may put me on record as being a hearty and thorough believer in it."

Mr. Nixon's case is not a peculiar one. Thousands have been benefited by the use of Compound Oxygen. Among those who have experienced its wonderful curative properties are Judge Flanders, of New York; Edward L. Wilson, the popular lecturer and photographer; T. S. Arthur, the well known author, and Judge Kelley, of Philadelphia; Mrs. Mary A. Livermore, the eminent lecturer; and many others equally prominent.

If you are interested to know what it has done for others, and what it can do for you, send to Drs. Starkey & Palen, 1109 Girard Street, Philadelphia, who will send you free a treatise on this remarkable vitalizer—its discovery, nature, action, and cures.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted.—Patented articles or hardware specialties to manufacture on contract or to manufacture and place on the market. First-class facilities. Correspondence solicited. Address Hull Vapor Stove Co., Cleveland, Ohio.

Grindstone Truing Device.—Price, $16, with 7-inch roll; $20, with 12-inch roll. Brown & Sharpe Mfg. Co., Box 469, Providence, R. I.

Reliable Dividers for machinists and draughtsmen. Catalogue free. J. Stevens & Co., Box 28, Chicopee Falls, Mass.

Special tools and machines of every description. Interchangeable Tool Co., 313 North 2d St., Brooklyn, N. Y.

Skating Caps.—Our machine makes the best. Lamb Knitting Machine Co., Chicopee Falls, Mass.

Miners supplied with pumps for every service by Valley Machine Works, Easthampton, Mass.

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Catalogue of Books, 128 pages, for Engineers and Electricians, sent free. E. & F. N. Spon, 35 Murray Street, N. Y.

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NEW BOOKS AND PUBLICATIONS.

THE RESCUE OF GREELY. By Commander W. S. Schley, U. S. N., and Professor J. R. Soley, U. S. N. New York: Charles Scribner's Sons, 1885.

In this very clear and straightforward account of the rescue, the authors have produced a book which will prove attractive even to those who have not hitherto been interested in the progress of Arctic discovery. While it has been the chief purpose of Commander Schley and his associate to relate the circumstances attending the Relief Expedition of 1884, they have added much to the interest of their book by an admirable introduction. One-third of its contents has wisely been devoted to the recital of those events which originally placed Greely at Lady Franklin Bay, and made the final expedition imperative. The reader is familiarized with the ground by a brief sketch of the geography of Baffin's Bay and of the ice barriers which impede its navigation. An account of the general plan of the circumpolar stations as proposed by Weyprecht explains the mission of Greely and his party at so desolate a post as Fort Conger. Then follows that dreary chapter of accidents which made the expeditions of the Neptune and the Proteus so utterly ineffectual, the station at Littleton Island no more than a promise, and the word of a great government an unredeemed pledge. Prepared by this introduction, the reader is placed in a position to follow intelligently the subsequent movements of the Thetis and Bear in effecting the final rescue. From the first he is made to feel that his sympathies are engaged in a successful enterprise, and to share in a measure the enthusiasm of the rescuers. An occasional explanation places some censured action in a truer and more favorable light, but as a rule the promised freedom from comment is favorably observed. The book is illustrated by fourteen engraving and three very serviceable maps.

AN INTRODUCTION TO PRACTICAL CHEMISTRY, INCLUDING ANALYSIS. By John E. Bowman, F.C.S. Edited by Charles L. Bloxam, Philadelphia: P. Blakiston, Son & Co., 1885.

In this eighth edition of an already well known book, several valuable additions have been made. The gravimetric methods of analysis have been considerably extended, and a new chapter on volumetric analysis added. The chemical nomenclature has also been modernized. The book is divided into five parts, which have for their purpose respectively: General Chemical Experimentation; the Qualitative Analysis of Inorganic Salts and of the more common Organic Acids and Alkaloids; Examples in Qualitative Analysis; Quantitative Analysis; and the Use and Preparation of Reagents. In the appendix, several useful tables have been included. The text is clear, and the eye is materially assisted by a judicious variation in the type. Wood cuts are sparingly used to illustrate the different processes, and are generally satisfactory. The arrangement and style are excellent. Much valuable information has been condensed into convenient space, which will commend the book to the amateur analyst, as well as to the student just beginning the science of chemistry.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) B. W. B.—Persimmon bark is an astringent, and is said to have been used advantageously in intermittents, and in the form of a gargle in ulcerated sore throat.

(2) G. M. W.—You can become an expert runner by practice only. It is possible that you are not adapted by nature to running.

(3) D. R. R. asks: How many pounds pressure does it require to force water up a half inch pipe, grade 30 feet, distance 300 feet? A. 15 or more pounds, according to velocity.

(4) J. M. H.—While book knowledge is very valuable to mechanical engineering, shop practice is more important. Both are desirable and necessary. There is no end of books which you might read.

(5) C. H. K.—Two and a quarter times as much water will pass though a three-eighth inch hole as through a one-quarter inch hole under the same conditions.

(6) W. F. C. asks if there is any kind of solder that can be used with a soldering iron that will take a plate of nickel and be the same color as the rest of the work. We use high brass and low brass and copper. A. Use pure tin.

(7) A. & C. H. write: We have a horizontal boiler, and the flues leak around the ends, caused by being heated when there was no water in the boiler. How shall we remedy this? A. Get the nearest boiler maker to expand the tubes. Anything that you can put into the boiler to stop the leaks will only be a temporary makeshift, and may give you more trouble in the end.

(8) O. F. asks: 1. What is best for me to use for dissolving the Russian isinglass (that which is used for clarifying purposes)? Alcohol does not seem to answer. A. Try acetic acid. 2. What can I mix with paint in order to produce a lasting and glossy appearance when it becomes dry? A. Use boiled linseed oil.

(9) E. S. writes: In chemistry is there any such thing as atomic weight? And if so, please give the definition. A. Atomic weight is used to designate the weight of any of the elementary substances in comparison with the weight of hydrogen. Thus we accept 1 as the atomic weight of hydrogen, and therefore, finding oxygen sixteen times as heavy, we give to this latter substance the atomic weight of 16.

(10) J. H. J. writes: In your issue of the 14th instant, you give a receipt for making liquid glue, in which you say, "100 parts best Russian glue." Where can Russian glue be obtained? And why Russian? Will not the best American or French answer as well? A. Russian glue is prepared from the intestines of fish, and is considered more tenacious than the ordinary varieties of glue. It can readily be substituted by the commercial article known as "fish glue," which can be procured from any wholesale paint house.

(11) J. B., of the United States Army, asks a recipe for making a brilliant black gloss or polish applicable to black leather belts and boxes, so that they will look well at parades and inspections. Also how the brilliant gloss on patent leather is obtained? A. Boiled linseed oil and lampblack, with a drier, form the base of different compounds for leather dressings, but you had better buy one of the many preparations for your purpose. The patent leather gloss is obtained by baking japan on the leather in an oven, and is a very difficult process.

(12) F. L. asks how to imitate walnut graining. A. Try the following: The wood, previously thoroughly dried and warmed, is coated once or twice with a stain composed of 1 ounce extract of walnut peel dissolved in 6 ounces of soft water by heating it to boiling, and stirring. The wood, thus treated, when half dry is brushed with a solution of 1 ounce potassium bichromate in 5 ounces boiling water, and is then allowed to dry thoroughly, and is to be rubbed and polished as usual.

(13) S. A.—The white Castile soap is probably the best soap known. It consists of soda and pure olive oil. The olive oil is sometimes substituted in part as follows: Olive oil 40 parts, ground suet and tallow 30 parts each. Caustic potash is used instead of soda, but it is more expensive, and the soap is a softer article. See the articles on "Soap and its Manufacture" in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 308, 325, 330, and 360.

(14) D. H. B.—The pressure of wind at 20 miles per hour is 2 pounds per square foot. As there are some conflicting elements in the computation for your special form of windmill, to determine its power we can only recommend you to make a practical trial, which is far more reliable, and takes in the elements of friction, variable angle of sails, and back action behind the hood, caused by the angular position of the windward arm.

(15) L. M. B.—For the volume of spherical domes—Rule: To 3 times the square of the radius add the square of the height of dome; multiply this sum by the height of dome, and multiply this product by 0·5236, or $3r^2+h^2h\times0{\cdot}5236$. For volume of a cone: Multiply area of base by the height, and take one-third the product.

(16) J. P. S. asks: Would a cornet player be able to use his instrument successfully after having his upper teeth extracted and a false set put in? And are there good players so situated? A. A player having false teeth can use his instrument, but cannot play so well; we doubt if there are any very good players with false teeth.

(17) J. P. L.—To find how much tin vessels will hold, use the following rules: For the contents of cylinders: Square the diameter, and multiply the product by 0·7854. Again, multiply by the height (all in inches). Divide the product by 231 for gallons. For the frustum of a cone: Add together the squares of the diameters of large and small ends; to this add the product of the diameter of the two ends. Multiply this sum by 0·7854. Multiply this product by the height (all in inches). Then divide by 231 for the number of gallons.

(18) P. McF.—The right ascension of a planet is its distance from the vernal equinox or the point in the heavens at which the plane of the ecliptic crosses the plane of the equator measured upon the plane of the equator—the distance being measured in hours, minutes, and seconds, 24 hours representing the whole circle, or 360°. The declination north or south is the distance of a planet from the plane of the equator north or south in degrees, minutes, and seconds, reckoning from 0° at the equator to 90° at the pole. The diameter is its apparent size as seen from the earth in parts of a circle of 360°.

(19) S. L. S.—In regard to throwing two banks across a lake in which other owners might be interested, you should first ascertain what riparian rights you might infringe. The building of a safe dam on soft bottom is a very precarious undertaking; the silt being very mobile will not only move out from under the filling, but will also give no anchorage against the pressure. With a moderate depth of 4 or 5 feet of silt, a row of piles close together across the lake would be necessary to insure a footing. Then fill in with as coarse material as possible, making a hard rammed partition of clay or cement and sand on the pressure side of the pipes. Carry the partition as low as possible or below low water. Sheet piling with two rows of horizontal planking spiked and filled in on each side even with top, with broken stone, makes a cheaper spill than surface planking upon sills as sketched by you. Further, we do not understand from your letter whether it is a natural lake, the widening of a river, or a cut out from some river, all of which should be considered in any plan interfering with water flow. We do not consider that the current or depth that you speak of now interferes with the quality of the ice. You speak of white streaks and clear ice. Our best ice in this market is much marked in this way. These streaks are caused by the condition of the weather in the freezing season, alternate snow and rain, with wind, being particularly detrimental to a clear ice crop.

(20) R. S.—One of the very best scouring pastes consists of:

Oxalic acid	1 part.
Iron peroxide	15 "
Powdered rotten stone	20 "
Palm oil	60 "
Petrolatum	4 "

Pulverize the oxalic acid and add rouge and rotten stone, mixing thoroughly, and sift to remove all grit; then add gradually the palm oil and petrolatum, incorporating thoroughly. Add oil of myrbane or oil of lavender to suit. By substituting your red ashes from stove coal, an inferior representative of the foregoing paste will be produced.

(21) G. W. W.—Dynamite or giant powder consists of about 75 per cent nitroglycerine and 25 per cent of some absorbent, generally infusorial earth. Its manufacture is attended by many difficulties as well as being exceedingly dangerous, and unless you have had considerable experience in chemical manipulation, you will be unable to prepare it.

(22) S. J. writes: I set out 50 young apple trees last fall on some sandy soil. Should it be dry next summer, would it be well to lay last fall's apple pomace around them, and how thick would be safe? A. Yes; 4 to 6 in. deep.

(23) W. D. G., Jr., asks: How large a main pipe will be required to supply 6 hydrants and 50 dwelling houses, the water to be brought 1 mile with a 70′ head; the hydrants to be used with a 1″ nozzle, and there being no probability of more than two being required at a time? A. About a 6″ pipe; a smaller one would not give the desired pressure for hydrant uses.

(24) E. F. P. asks for a substance for polishing brass trinkets in a tumbler. A. Use leather scraps or skivings and tripoli, with rotten stone or pulverized pumice stone for first polishing; finish for a shine with rouge and skivings in another tumbler.

(25) T. F. W.—If you require power, it pays to use the exhaust of any engine for heating purposes. Independent of the want of power, and for a small place, a hot air furnace is the cheapest. For large buildings a low pressure steam apparatus has many advantages. Better advise with parties in the steam heating business.

(26) E. P. O. writes: Suppose a cannon is placed on a railroad car so as to shoot perpendicularly into the air, with force enough behind the bullet to carry it a mile high at the rate of a mile a minute, the railroad car also moving at the rate of a mile a minute when the cannon is discharged; how far will the cannon and ball be apart when the ball strikes the earth? A. The question supposes an impossibility; one cannot shoot a bullet to go a mile high at the rate of only a mile a minute; if started at that rate, it would drop to the ground as quickly as a marble snapped from the fingers.

(27) W. D. C.—We do not see how any chemicals can be put on the undressed side of leather to render it capable of being smoothed with emery cloth. The fibrous character of the leather is of such nature that the smoothing is done with a very little grease and rolling, hammering, or slicking.

(28) E. S. T. asks for a good receipt for good office mucilage? Take 2 parts of gum dextrine and add 1 part acetic acid with 5 parts of water. Dissolve over a water bath and add 1 part alcohol.

(29) C. E. O. asks what "Sozodont" is composed of? A. Take of:

Potassium carbonate	½ ounce.
Honey	4 "
Alcohol	2 "
Water	10 "
Oil of wintergreen and oil of rose, to flavor, sufficient.	

(30) B. A. H. asks how to make a polishing paste for blackening and polishing stoves? A. Try the following: black lead pulverized, 1 lb.; turpentine, 1 gill; water, 1 gill; and sugar, 1 oz.

(31) G. G. writes: Some months ago I was shot in the face; it is all healed, but left quite a scar, and in order to hide it, want to raise a beard. I have a growth of hair, but not sufficiently strong, therefore ask you the question if there is a remedy that would force hair to grow, and what it is. A. Where the hair glands have been destroyed, it will, of course, be impossible to produce a growth of hair. The use of borax in the water employed for washing, together with stimulating lotions containing small amounts of tincture of cantharides, is frequently of service. Such a lotion may consist of ½ oz. tincture of cantharides, 2 oz. eau de Cologne, ½ drm. oil of nutmeg, and 10 drops oil of lavender.

(32) G. B. writes: I want to run a short telegraph line (100 yards) between two offices. Please give diagram and principal connections for single line? A. For a telegraph line of the length stated, you may place your battery, sounders, and keys all in one circuit; your ground connections at the ends may consist of wires attached to gas or water pipes, or you may connect your ground wires with metallic plates having about 20 sq. ft. area, and buried in earth that is constantly moist.

(33) F. B. B.—It is not an easy matter to repair a mirror, but if it is silvered with mercury amalgam, you may be able to repair it by cleaning a space on the back of the mirror large enough to remove the scratch, then moistening the amalgam on the back of a piece of mirror with a little mercury, and cutting out a patch from the amalgam so moistened which will fit the cleaned place on the back of your mirror; then carefully slip the patch from the piece of mirror and place it in position on the injured mirror, then place on the back of it a piece of cloth and then a weight. Allow it to remain several days in this condition. If the work has been carefully done, the patch will not be noticed.

(34) F. A. K. asks if the electric current produced by small jets of steam is of any value? A. The electric current produced in the manner described is of no practical value.

(35) W. J. M. writes: 1. I am making some magneto call bells, which do not work satisfactorily on account of the revolving armature, which is of cast iron, becoming charged; how will I treat them so as to prevent this? I have tried many receipts to soften cast iron, but failed. I hope you will send me a receipt that will save me further trouble. A. Heat your cast iron very hot, and bury it in powdered slaked lime to cool. 2. What is the best kind of steel to make the permanent magnets of, such as used in all the telephone call bells? I am using cast steel hardened in salt and water. Is there a better way for doing the same? A. Chrome steel is said to be best for this purpose. Only the ends of the magnets need to be hardened. 3. Is Alvar steel any good for magnets, if so, where can I procure it? A. We do not know of any steel by that name. 4. Have you got a SUPPLEMENT giving full instructions how to construct an electric bath? A. If you mean an electroplating bath, see SUPPLEMENT 310. 5. What is the electromotive force of a single Leclanche cell in volts? A. About 1·48 volts. 6. Would you consider it an improvement on the Grove battery by using a solution of washing soda instead of sulphuric acid? A. It depends upon the results secured.

(36) M. & A.—In hardening such small springs, we suggest the use of a muffle or small chamber made of fire clay in the shape of a half cylinder with one end closed; or iron will answer the purpose, but will soon burn out. Build the muffle in a small brick furnace, so that the fire may be in contact with top and bottom. The springs can be passed into the muffler with a small tongs, and taken out as fast as heated. In this way a dozen or more may be heating at once. Harden in water or oil in the usual way. For drawing the temper, we think there is nothing better than a pot of boiling oil (linseed), in which dip the springs a few seconds until they are of the same temperature as the oil, then quench in hot water, which will leave enough heat in the springs to dry them. For this operation a flat-bottom basket made of wire makes a very convenient way of handling 3 or 4 dozen at once. Some use red hot lead in a crucible for heating articles for hardening. We do not think it best where large numbers are to be handled, as the springs would have to be held under the lead, which might be troublesome.

(37) E. O.—Emery wheels are in common use for grinding tools. A little care only is required to keep the tools from heating, and thereby destroying the temper.

(38) J. H. S.—We know of no remedy for your wet wall but furring off and newly lathing and plastering in the regular way. It is the cold wall that condenses the moisture of the rooms. The kitchen is the principal source of excessive moisture.

(39) W. F. K.—To run your copper into ingots, treat it in the crucible with borax and soda as a flux. Heat the moulds so as to make them perfectly dry before pouring the metal.

(40) C. C. C. asks: Which would be the best test for water works—to have three streams on one main near each other, or three streams on different mains scattered over the town? The mains, 8 in., 6 in., and 4 in., works half a mile from town. A. If you are testing in the interest of contractors, place the trial streams as near the source of supply as possible, and also near the 8 inch main. A fair test will be to locate the streams widely apart on one distributing branch.

(41) G. C.—Coke is supposed to be free from sulphur or other deleterious gases. We have little experience here with coke fired boilers, but learn that in England coke has a high reputation as a steam fuel.

(42) A. B.—Galvanized iron is generally used in damp places. Copper and brass are the only substitutes, both of which are more expensive, their values depending upon the conditions of their use.

(43) W. C. H.—Knife sharpeners and glass cutters are made of fine steel only, and given an extra hard temper. Hard bronze, 75 parts copper to 25 parts of tin, makes a very hard alloy, and can be melted in a brass furnace and cast. It is not as hard as the hardest steel, but will make very good cutting instruments. Can be cast in iron moulds. Iron may be readily brazed in a forge, or if small, with a blow pipe.

(44) J. M. C. asks: Will it destroy the power of a balance wheel by running a belt from it to a shaft? A. It will not. 2. We use a 6 horse power engine set on a cast frame; the fly wheel is 26 inches in diameter, 1½ inch rim, 5 inch face, weighs about 150 pounds; will it be safe to put on about a 450 or 500 pound fly, or about what size and weight would do? A. If the engine now runs steady or evenly, more fly wheel will not be beneficial. If there is much shafting with pulleys and a belt on the present fly wheel, you will gain nothing by adding another and heavier fly wheel.

(45) A. F. McE. writes: We carry 60 pounds steam on a boiler used to run an Armington & Sims 35 horse power engine for incandescent lighting. The exhaust from this engine is connected into the 8 inch main steam pipe of low pressure heating apparatus, on which we carry a pressure of 7 pounds. Will you please tell me, through the columns of your paper, what is the thermal value of the exhaust of this engine in terms of the total heat of the steam in the boiler, or what part of the energy of this boiler is used in running the engine and what part is available for heating purposes? Temperature of feed water is 60° Fah. A. Your statement does not enable us to give you a clear answer. Carrying 60 pounds pressure in the boiler does not indicate the amount of steam used in the engine. This can only be done by indicator cards, which show the mean engine pressure, together with the speed record. On the other hand, you may be said to be using for heating purposes all of the thermal power generated and passed through the engine, with the only exceptions of the amount of radiation and leakage and the heat value that escapes to the atmosphere after heating the building. If you use all the exhaust for heating purposes without wasting, or, in other words, condense all the exhaust in the heating coils, you may safely conclude that you are running your engine free of cost while so utilizing the exhaust. The only apparent error in your system appears in the large amount of back pressure on the engine. The best examples of exhaust service in this vicinity exhibit a back pressure of 0 to ¼ pound, with the entire absorption of the thermal value of the exhaust in heating buildings.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

J. T. H.—The earth appears to be a light yellow ocher, too light in color and not possessing sufficient body to be valuable as a paint. For local wants, it could be used as a polishing powder and perhaps for inferior qualities of pottery. Nothing very definite can be said concerning it unless it were first analyzed.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted,

April 14, 1885,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Burglar alarm. Railway train alarm.
Amalgam strainer, J. Kirby 315,637
Amalgamating pan and settler apparatus for treating ores, M. P. Boss 315,893
Animal shears, G. H. Coates 315,733
Auger anchor, ground, Boehmke & Bohlken 315,593
Axle box, A. Fontayne 315,927
Axle box, car, W. E. Wilcox 315,581
Bag holder and lifter, J. A. Hamsch 315,778
Bag rack, R. E. Williams 315,688
Baking powder, A. Peters 315,830, 315,832
Baking powder, phosphate, A. Peters 315,831
Bale tie, wire, G. Nicholson 315,821
Baling press, J. R. & W. D. Slauson 315,850
Baling press, W. D. Slauson 315,965, 315,966
Baling press, upright beater, J. J. Platt 315,960
Barbers' chairs, head rest for, T. W. Patterson 315,540
Battery. See Electric battery. Galvanic battery.
Bed spring, L. M. Prowse 315,546
Beehive, J. G. Hubbs 315,505
Beer cooling and preserving apparatus, F. Beisinger 315,699
Beer, manufacture of, J. Von Rose 315,980
Belt fastener, L. W. Herrick 315,781
Belt replacer, J. J. Harnsberger 315,615
Benzaldehyde, production of chlorinated derivatives of, R. Gnehm 315,932
Berth, sleeping car, G. Leve 315,517
Billiard cue chalk, substitute for, A. Peple 315,828
Blind slat fastener, window, J. M. Van Dyke 315,861
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Boat, J. Forbes, Jr. 315,758
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Bolt. See Shutter bolt.
Bolt, J. J. Devine 315,748
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Boots, etc., composition of material for damp-proof socks or soles for, R. J. Baggaley 315,885
Bottle stopper, A. F. Kent 315,797
Bottle stopper fastener, W. Painter 315,655
Bottle stopper fastener, J. T. Walker 315,576
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Brick burning kiln, J. O'Brien 315,822
Brick machine, P. L. Simpson 315,849
Brick machine, A. D. Thomas 315,855
Brick pressing machine, S. P. Crafts 315,601
Bridle loop, G. L. Smith 315,672
Buckle, C. T. De Forest 315,486
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Stone sawing machine, J. H. Frenier 315,608
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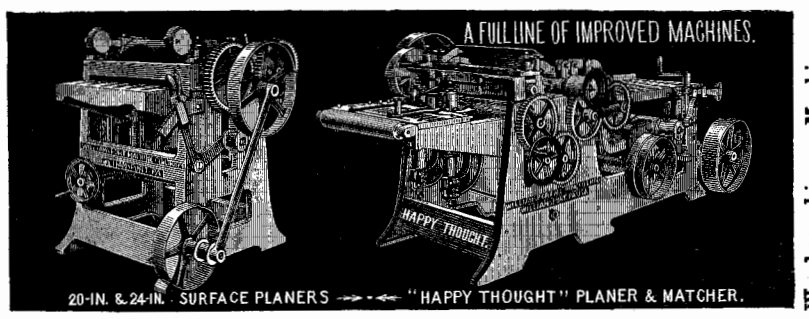

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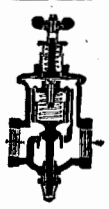

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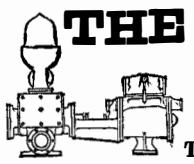

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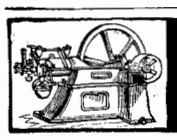

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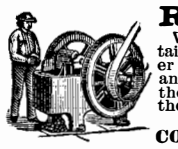

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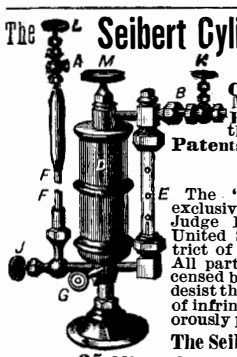

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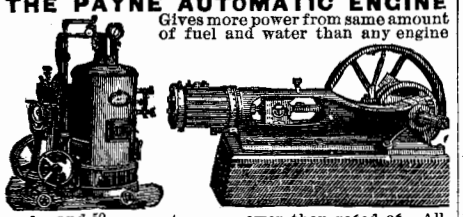

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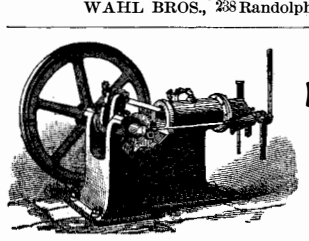

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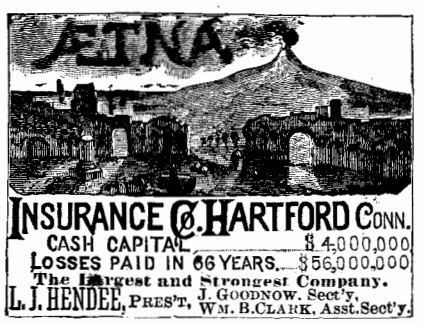

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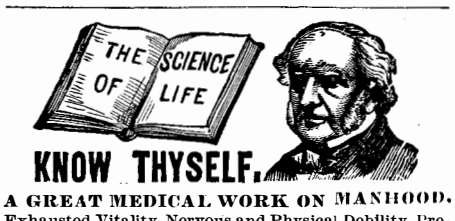

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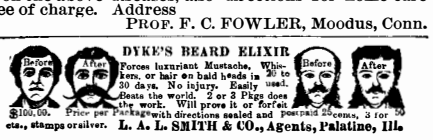

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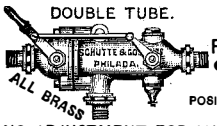

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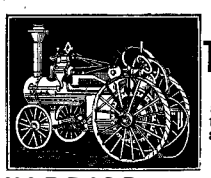

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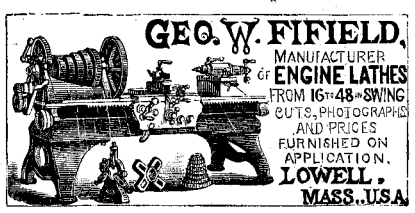
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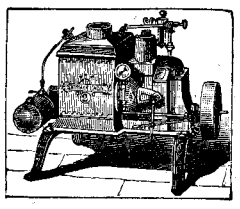

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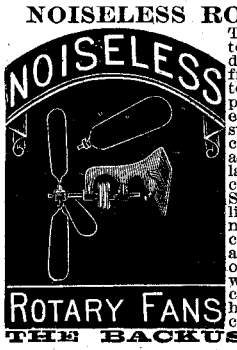

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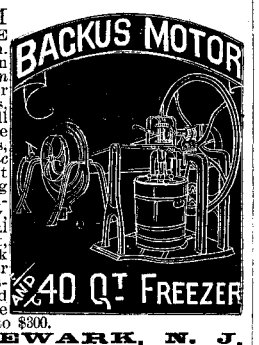

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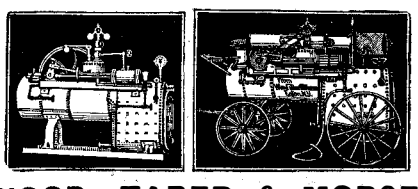

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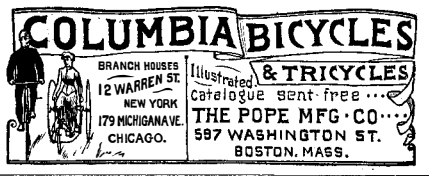

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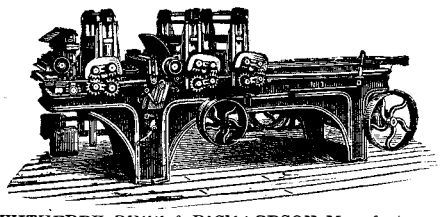

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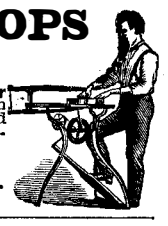

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